UNIVERSITY OF ALBERTA

THE TRANSTHEORETICAL MODEL AND ITS APPLICATION TO ADOLESCENTS' PHYSICAL ACTIVITY BEHAVIOR

BY

ANGELA L. COONEY ©

A thesis submitted to the Faculty of Graduate Studies and Research in Partial fulfillment
of the requirements for the degree of MASTER OF ARTS

FACULTY OF PHYSICAL EDUCATION AND RECREATION

EDMONTON, ALBERTA
FALL 1996

National Library
of Canada

Acquisitions and
Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale
du Canada

Direction des acquisitions et
des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-612-18151-0

Canada

UNIVERSITY OF ALBERTA

LIBRARY RELEASE FORM

NAME OF AUTHOR:	ANGELA L. COONEY
TITLE OF THESIS:	THE TRANSTHEORETICAL MODEL AND ITS APPLICATION TO ADOLESCENTS' PHYSICAL ACTIVITY BEHAVIOR
DEGREE:	MASTER OF ARTS
YEAR THIS DEGREE GRANTED:	1996

Permission is hereby granted to the UNIVERSITY OF ALBERTA LIBRARY to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly, or scientific research purposes only.

The author reserves all other publication and other rights in association with the copyright in the thesis, and except as hereinbefore provided neither the thesis nor any substantial portion thereof may be printed or otherwise reproduced in any material form whatever without the author's prior written permission.

Angela L. Cooney
4538 - 51st ST
Vegreville, Alberta
T9C 1L6

DATED: October 3, 1996

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled THE TRANSTHEORETICAL MODEL AND ITS APPLICATION TO ADOLESCENTS' PHYSICAL ACTIVITY BEHAVIOR submitted by ANGELA L. COONEY in partial fulfillment of the requirements for the degree of MASTER OF ARTS.

A. B. Nielsen

A.B. Nielsen

W Rodgers

W.M. Rodgers

E W Romaniuk

E.W. Romaniuk

DATED: Oct 1, 1996

ABSTRACT

This study examined the Transtheoretical Model and its application to adolescent physical activity behavior. The relationship between stage of change and self-reported exercise behavior, processes of change, self-efficacy, and decisional balance were examined. Subjects were 544 students enrolled in eight urban secondary schools. A questionnaire survey was used.

Eight out of the ten processes of change, self-efficacy, pros, cons, decisional balance, and self-reported physical activity significantly contributed to discrimination between the stages. The use of the processes of change fluctuated across the stages though clear differentiation was not as apparent in this study as within previous literature. Self-efficacy increased from Precontemplation to Maintenance. Precontemplators scored lowest and those in Maintenance scored highest on the self-efficacy, the pro, and decisional balance measures, with this trend reversed on the con scale. Again, clear differentiation between the stages was not apparent and the balance between pros and cons did not change from Precontemplation to Preparation. Finally, Precontemplators participated in the least and Maintainers participated in the most amount of self-reported physical activity.

Female adolescents were more likely to be in a lower stage of exercise adoption. Adolescents enrolled in optional Physical Education classes (P.E. 10 &20) and involved in extracurricular activities and holding down jobs were more likely to be in the higher stages of exercise adoption.

Though the results of this study partially support those reported within previous literature, there are discrepancies between studies using the Transtheoretical Model with adults and this study. Portions of the model (i.e. processes of change and decisional balance) needs further adjustment before it can be efficaciously applied within an adolescent population. Implications and suggestions for further research are discussed.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank all of those individuals who assisted tremendously in the completion of this thesis. To my family, the Faculty of Physical Education and Recreation support staff, Edmonton Public and Separate School Boards, the participating schools, the teachers who allowed me to enter their classrooms, and to the students who agreed to participate in this study, I offer my sincere thank you and gratitude for all that you have done.

I would especially like to thank Dr. Brian Nielsen, Dr. Wendy Rodgers, and Dr. Eugene Romaniuk for all of their assistance and advice on the road to completing this research project.

TABLE OF CONTENTS

Chapter **Page**

I. INTRODUCTION ---------- 1

Significance of the Study 1

Purpose 5

Objectives of the Study 6

Definition of Terms 7

Delimitations 10

Limitations 10

II. REVIEW OF LITERATURE ---------- 12

Introduction..........12

The Determinants of Adolescents' Activity Participation..........12

Physical Activity and Exercise Intervention Strategies..........15

Theoretical Models in Physical Activity and Exercise Promotion 19

The Transtheoretical Model..........20

Stages of Change..........22

Processes of Change..........26

Decisional Balance 30

Self-Efficacy..........33

Summary..........36

III. - METHODS AND PROCEDURES ---------- 37

Subjects.......... 37

The Research Design.......... 37

Data Collection 37

Measures.......... 38

Stages of Exercise Behavior.......... 38

Processes of Exercise Adoption and Maintenance.......... 39

Decision-Making for Physical Activity and Exercise.......... 40

Confidence for Physical Activity and Exercise 40

Self Report Measure of Physical Activity and Exercise.......... 41

Intention of Exercise Behavior.......... 42

Analyses 42

IV. - RESULTS AND DISCUSSION ---------- 43

Response Rate.......... 43

Demographic Profile of Participants.......... 43

Processes of Change 49

Decisional Balance.......... 58

Self-Efficacy 61

Self-Report of Physical Activity and Exercise 62

Intention of Exercise Behavior 65

V. - SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS ---------- 67

Summary and Conclusions 67

Recommendations 76

REFERENCES --- 78

APPENDIX A - Exercise behavior survey. 88

APPENDIX B - Informed consent form. 95

APPENDIX C - Stage of change measure and coding key. 97

APPENDIX D - Processes of behavior change measure. 99

APPENDIX E - Decision-making for physical activity/exercise measure. 102

APPENDIX F - Self-efficacy or confidence for physical activity/exercise measure. 104

APPENDIX G - Self-report measure for physical activity/exercise................................105
- Seven day physical activity recall measure.
- Physical Activity Self-Report Item.

APPENDIX H - Intention to exercise measure. 107

APPENDIX I - ANOVA's for Each Process of Change 108

LIST OF TABLES

Table 1 Definition of The Stages of Change.....22

Table 2 Processes of Change: Definitions and Internal Consistencies.....27

Table 3 Chi Square Cross Tabulation: Stage of Change and Gender.....47

Table 4 Chi Square Cross Tabulation: Stage of Change and Class.....47

Table 5 Chi Square Cross Tabulation: Stage of Change and Other Activities.....48

Table 6 Processes of Change: Mean, Standard Deviations, ANOVA's, and Tukey Results by Stage.....51

Table 7 Behavioral and Experiential Processes: Means and Standard Deviations by Stage.....56

Table 8 Pro, Con, and Decisional Balance Indices: Mean Scores and Standard Deviations.....59

Table 9 Self-Efficacy Index: Mean Scores and Standard Deviations.....61

Table 10 Self-Reported Frequency ofVigorous Physical Exercise: Mean Frequency of Hours and Standard Deviations.....63

Table 11 Seven Day Physical Activity Recall: Mean Scores and Standard Deviations.....63

Table 12 Average Frequency of Exercise Over the Past Four Months: Mean Scores And Standard Deviations.....64

Table 13 Intention to Exercise Over the Next Three Months: Mean Frequency and Standard Deviations.....66

LIST OF SYMBOLS AND ABBREVIATIONS

Symbols

n	Number in Sample
X^2	Chi Square
$\bar{x}$	Mean
SD	Standard Deviation
n^2	Effect size (Eta square)

Abbreviations

PC	Precontemplation
C	Contemplation
P	Preparation
A	Action
M	Maintenance
CR	Consciousness Raising
CC	Counterconditioning
DR	Dramatic Relief
ER	Environmental Reevaluation
HR	Helping Relationships
RM	Reinforcement Management
SL	Self Liberation
SR	Self Reevaluation
SoL	Social Liberation
SC	Stimulus Control
P.E.	Physical Education
C.A.L.M.	Career and Life Management

CHAPTER 1

INTRODUCTION

Significance of the Study

It is now common knowledge that regular participation in physical activity and exercise is a key component in the maintenance of good health. Unfortunately, regardless of how clear and widely acknowledged the benefits of exercise and physical activity have become, attention to the lack of appropriate levels of physical activity and exercise within the North American population has continued to surface within the literature. Only 25 percent of Canadian adults are thought to be highly active (Stephens, Craig, & Ferris, 1986) and 40 to 60 percent of Canadians are insufficiently active to achieve any health benefit from activity (Stephens & Craig, 1990). Even more disconcerting is that while active living and health promotion movements are in the forefront of some of the current societal concerns in Canada, children are also not sufficiently active to produce desired health benefits. It has been estimated (CAHPER, 1992 - 1993) that less than 60 percent of youth participate in regular physical activity or exercise likely to alter their health related fitness.

Unfortunate as it may seem, sedentary lifestyle patterns and behavioral trends toward inactivity are already well established within many adolescents. As forms of inactive entertainment such as television and video games have become more popular, adolescents have become increasingly more obese (Ross & Gilbert, 1987) and many exhibit high risk profiles for cardiovascular disease (Berenson, McMahon, & Voors, 1980). The necessity for daily physical activity and exercise seems to have been greatly reduced by the mechanization and automation of work and leisure and as a result physical activity and exercise are no longer a habitual part of life for most children (Kemper, 1994). The high-risk profiles of a substantial number of these children could potentially have long-term consequences in that inactivity tends to become more pronounced as a person ages (Paffenberger, Hyde, Wing, & Heish, 1986) and childhood risk levels are predictive of adult disease risk (Cresanta, Burke, Downey, Freedman, & Berenson, 1986).

Obviously, the challenge for researchers and clinicians no longer lies in proving the important role exercise and physical activity plays in decreasing the incidence of chronic disease. The principal challenge facing health scientists now lies in finding ways to help people initiate and maintain regular participation in physical activity and exercise throughout the lifespan. If the suggestions are valid that an adult's disinclination to exercise is linked to unfavourable physical activity patterns during adolescence (Simons-Morten, O'Hara, Simons-Morten, & Parcel, 1987) and childhood risk levels are predictive of adult disease risk (Cresanta et al., 1986), then a logical place for researchers and clinicians to initiate positive interventions is within an adolescent population. The rationale for wanting to optimize physical activity during adolescence is twofold: first, to promote physical and psychological health and well being during adolescence and second, to enhance future health by increasing the probability of remaining active as an adult (Sallis & Patrick, 1995).

A substantial amount of evidence supports the potential for improving physical health and well-being in a population by increasing physical activity and physical fitness in less active groups (Blair, Kohl, Paffenberger, Clark, Cooper, & Gibbons, 1989; Leon, Connett, Jacobs, & Rauramma, 1987; Slattery & Jacobs, 1988). The consensus statement on physical activity guidelines for adolescents states that during adolescence, daily physical activity is crucial for enhancing bone development that affects skeletal health throughout life, for reducing the risk of obesity, enhancing psychological health, increasing HDL-cholesterol, increasing cardiorespiratory fitness, and having other positive health benefits that have yet to be documented (Sallis & Patrick, 1995). Motivating adolescents to be physically active makes sense simply for their own health benefit.

As well, adolescence is viewed in developmental psychology as a time of experimenting in order to learn more about oneself in relation to others and to form an identity as an adult (Fertman & Chubb, 1992). It is a period in which cause and effect connections are made, that a mature or adult orientation toward causality is formed, and adult-like thinking begins to emerge (Sabatelli & Mazor, 1985). Adolescence is also believed to be an important period for learning health-related behavior patterns, including physical activity, that will carry over into adulthood (Engstrom, 1986). If adolescents identify and orient themselves with sedentary behavior, this pattern may be incorporated into the adult lifestyle leading to years of inactivity (Reynolds et al., 1990).

It cannot be denied that adult lifestyles are resistant to change and that it is supremely difficult to turn passive lifestyles into active ones. If strategies can be identified to motivate young people to engage in active lifestyles, the reactivation process that meets such resistance among adults may not be as necessary or may be made less difficult to undertake. Adolescence is therefore a critical period to investigate the components of physical activity and exercise not only for the sake of health benefit, but also for discovering adolescent motives for participation and the possible strategies that may be used to positively affect adolescent behavior before inactivity becomes firmly established (Perry et al., 1990).

Dishman and Dunn (1988) have succinctly summed up this logic through the following:

> "...It is important to understand childhood physical activity and exercise for early welfare, but useful insights may also be gained about facilitating later exercise and healthy activity habits in adults. Early activity histories and their determinants can help identify and interpret barriers and reinforcements for later activity."
>
> (p.158)

However, the process of increasing or changing physical activity and exercise habits is complex. It has been suggested that this complexity in affecting positive behavior change may be best understood by viewing physical activity and exercise initiation and maintenance as a sequence of stages through which different processes are applied over time (Knapp, 1988; Marcus, Banspach, Lefebvre, Rossi, Carleton, & Abrams, 1992). The Transtheoretical Model of Behavior Change, proposed by Prochaska and DiClemente (1982), is one such stage-based model of change that has recently been applied to the initiation and maintenance of physical activity and exercise.

The Transtheoretical Model was created to assist in understanding how people change their behaviors, either on their own or while in therapy (Prochaska & DiClemente, 1983). The Transtheoretical Model is a general model of intentional behavior change and was originally developed to explain or predict behavior change for addictive behaviors (i.e., smoking). This model was also created out of the recognition that psychotherapy was becoming increasingly more divergent and that augmented levels of intervention were needed. Essentially, the creation of the Transtheoretical Model was an attempt to develop a more comprehensive model of behavior change.

The application of a "stage approach" to studying the adoption and maintenance of regular physical activity is supported by many researchers in the exercise adherence field (Dishman, 1991; Sallis & Hovell, 1990; Wankel & Hills, 1994). The concept of stages is important for understanding change concerning physical activity and exercise involvement, in part because it reflects the temporal dimension or directionality in which change unfolds (Prochaska & Marcus, 1994). This model that has been so helpful in guiding research in the cessation of addictive behaviors can also help guide research in the acquisition of exercise and physical activity behavior in that the process of initiating physical activity and exercise can also be conceptualized as the cessation of a sedentary lifestyle (Prochaska & Marcus, 1994).

The Transtheoretical Model has been applied in an attempt to more clearly understand the initiation, adoption, and maintenance of exercise and physical activity (Marcus, Banspach, et al., 1992; Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Marcus, Selby, Niaura, & Rossi, 1992: Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992). A limitation in the research of the Transtheoretical Model within the exercise domain however, has been the sole use of subjects from work site and adult samples (Marcus, Rakowski, et al., 1992; Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992). Since these samples may not be representative of the population as a whole and it would be unreasonable to assume that all populations behave or feel the same way about exercise, it would seem necessary to examine the application of the Transtheoretical Model in a broad selection of population samples. For example, would the pattern of change and construct uses be the same for adolescents? By developing and extending the Transtheoretical Model so that it provides a framework for integrating the diverse variables of physical activity and exercise initiation and maintenance, a better understanding of the determinants of adolescent exercise behavior and the exercise adoption process may be attained and more efficacious exercise intervention designs may be developed as a result.

The current "Achilles Heel" of programs for adolescents is the difficulty in creating approaches that are appealing and meaningful for them, particularly when health-enhancing behaviors may not be as highly valued as unhealthful behaviors. One of the obligatory components in the development of primary prevention programs is the search for salient values and motivations of young people which can then be used in developing a lifestyle strategy (Prokhorov, Perry, Kelder, & Klepp, 1993). Programs that are designed to increase activity might be more effective if the precursors of adolescent physical activity and exercise were better understood. Knowledge of the psychological variables that predict physical activity might help guide the development of effective programs (Reynolds et al., 1990), provide keys to motivating children and youth to participate in physical activity, and help adolescents to develop activity patterns that they will maintain throughout their lives (Tappe, Duda, & Ehrnwald, 1989). The Transtheoretical Model may very well be an effective tool to be used in gaining a better understanding of the precursors of adolescent physical activity and exercise.

Purpose

The goal of this investigation was to determine the application of the Transtheoretical Model to the exercise behavior of adolescents. Specifically, the relationship between stages of exercise behavior and the processes of exercise behavior (Prochaska & DiClemente, 1983), decisional balance (Jannis & Mann, 1968; 1977), and self-efficacy (Bandura, 1977a;1977b) for exercise were studied within a secondary school student population. This investigation attempted to determine the utility of the Transtheoretical Model for understanding physical activity and exercise adoption and maintenance and the relationship of different stages of exercise behavior to measures of exercise specific self-efficacy, the processes of exercise behavior change, and decisional balance within an adolescent population. It was envisioned that this investigation might enhance knowledge concerning the utility and application of the stage of change model and provide important information on the factors that potentially influence intentions to exercise in this population.

Objectives of the Study

Each of the following hypotheses was explored:

1) Each subject will be able to be categorized into one of five stages of change. These stages namely being: Precontemplation, Contemplation, Preparation, Action, and Maintenance.

2) The current self-reported exercise behavior will significantly relate to each subjects' stage of change classification.

3) The stage of change classification will significantly relate to future intention to exercise.

4) The pros and cons of exercise behavior (decisional balance) will significantly relate to stage of exercise behavior. In particular, persons in Action and Maintenance will have a decisional balance favouring the benefits of exercise, persons in Precontemplation and Contemplation will have a decisional balance favouring the costs of exercise, and for those persons in Preparation, the costs and benefits of exercise will be in balance.

5) Self-efficacy for exercise will significantly relate to the stage of exercise behavior. In particular, those persons in Precontemplation and Contemplation will have the lowest self-efficacy for exercise, and those persons in Maintenance will have the highest self-efficacy for exercise.

6) Study participants will utilize ten processes of change: consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, social liberation, counter conditioning, helping relationships, reinforcement management, self-liberation, stimulus control.

7) Use of each process of change will be significantly relate to each subjects' stage of change, such that:

a. Precontemplators will use each of the 10 processes of change substantially less than subjects in other stages.

b. Preparers will tend to use the behavioral processes more often than Contemplators, whereas the use of the experiential processes will not differ between these two stages.

c. Actors will use both the experiential and behavioral processes more often than

Preparers.

d. There will be a decrease in the use of experiential processes, but not in the use of behavioral processes, for individuals in the Maintenance stage as compared to those in Action.

Definition of Terms

In order to ensure consistency throughout the report of this study, the following terms warrant clarification.

1. Physical Activity or Exercise - Physical activity and exercise are used as reciprocal terms throughout this report. These two terms are used to refer to "repetitive bouts of leisure-time physical activity, conducted over periods of weeks or months, with the intention of developing physical and/or physiological fitness" (Bouchard, Shephard, Stephens, Sutton, & McPherson, 1990, p.6).

2. Regular Physical Activity or Exercise - Regular physical activity or exercise is defined as exercising three or more times per week for at least 20 minutes each time (Sallis & Patrick, 1995; American College of Sports Medicine, 1990).

3. Stages of Change - Individuals attempting behavior change move through a series of stages. These stages are constructs intermediate to traits and states. Traits are usually considered very stable and not open to change and typically, states lack stability and are very readily changed. Stages are both stable and open to change. That is, stages can last over considerable periods of time but are still dynamic in nature (Prochaska & Marcus, 1994). As well, movement through these stages does not always occur linearly as the possibility does exist that relapsing back to an earlier stage may occur. Change is hypothesized to occur in a cyclical rather than a linear pattern because many individuals must make several attempts at behavior change before they can realize their goals (Prochaska, DiClemente, Norcross, 1992). Progress through these stages also occurs at varying rates, with some

individuals remaining 'stuck' in certain stages, while others progress forward or relapse to earlier stages (Marcus, Pinto, Simkin, Audrain, & Taylor, 1994). The stages of exercise behavior change are characterized as follows:

a). *Precontemplation* - Period in which the individual is sedentary and is not thinking of making regular exercise part of their lifestyle within the next six months.

b). *Contemplation* - Period of time in which the individual is seriously thinking of initiating regular physical activity within the next six months but is currently sedentary.

c). *Preparation* - Period of time in which the individual is seriously thinking of making regular physical activity part of their lifestyle within the next month and may have made some behavior changes. Individuals may exercise some but not regularly in this stage.

d). *Action* - Period from the initiation of regular exercise to six months following the maintenance of the behavior change.

e). *Maintenance* - Period from six months post behavior change onward that the individual has maintained regular involvement in exercise.

4. Processes of Change - The processes of change are the cognitive, affective, and behavioral strategies and techniques that individuals use as they progress through the different stages of change over time. Processes of change are covert and overt activities that individuals use to modify their experiences and environments in order to modify behavior. There are ten processes of change that have been identified and defined in terms of exercise behavior (Marcus, Rossi, et al., 1992, p.425).These ten processes include:

a). *Consciousness Raising* - Efforts by the individual to seek new information and to gain understanding and feedback about remaining sedentary. This process involves increasing one's own awareness regarding the defences that are used against becoming physically active as well as gaining information regarding the outcomes of sedentary behavior.

b). *Dramatic Relief* - Affective aspects of change, often involving intense emotional experiences related to the problem behavior. This process involves the cathartic release of emotions and anxiety that may be evoked when considering the health hazards of inactivity.

c). *Environmental Reevaluation* - Consideration and assessment by the individual of how the problem affects the physical and social environments.

d). *Self-Reevaluation* - Emotional and cognitive reappraisal of values by the individual with respect to being inactive. The individual reevaluates how they think and feel about the outcomes of a sedentary lifestyle.

e). *Social Liberation* - Awareness, availability, and acceptance by the individual of alternative, problem-free life styles in society. The individual recognizes that becoming active is an acceptable alternative.

f). *Counterconditioning* - Substitution of alternative behaviors for remaining inactive. This process involves changing the way one thinks and feels about inactivity and activity.

g). *Helping Relationships* - Trusting, accepting, and utilizing the support of caring others during attempts to change inactive lifestyles to active ones.

h). *Reinforcement Management* - Changing the contingencies that control or maintain being inactive. This process involves providing rewards for being active and removing rewards for inactivity.

I). *Self-Liberation* - The individual's choice and commitment to change the problem behavior, including the belief that one can change. The individual recognizes that they have the ability to choose whether or not to be active and accepts the responsibility associated with that choice.

j). *Stimulus Control* - Control over situations and other causes that trigger the problem behavior. This process involves both increasing cues for exercise and decreasing cues for inactivity.

5. Self-Efficacy - A person's belief that he or she can accomplish some goal. An individual's confidence in and about their ability to perform a given behavior (Bandura, 1977a;1977b).

6. Decisional Balance - Jannis and Mann (1968; 1977) describe the process of decision-making using a Decisional Balance Sheet to assess costs and benefits of behaviors to self and others. Decisional balance is a comparison of the perceived positive aspects (pros) and negative aspects (cons) of a new behavior. It is a schema for monitoring potential gains (pros) and losses (cons) arising from any decision.

Delimitations

The following are restrictions involved in this study:

1. Only those students enrolled in secondary schools within the city of Edmonton were recruited for participation in this study.

2. Eight schools were recruited for this study. Four schools from the Edmonton Public School System and four schools from the Edmonton Separate School System were chosen to participate in this project.

3. The results of this study were based upon data collected from adolescents who attend urban high schools.

4. This study was cross-sectional in nature and data was collected through the use of a questionnaire survey. The measure of each variable is delimited to the use of self-report instrumentation.

5. This study also attempted to replicate previous findings therefore scales developed for past studies were used for data collection.

Limitations

The following are conditions that the researcher was not able to control in this study:

1. The validity of the information that was provided during the data collection phase may be limited by the ability and willingness of the subjects to provide precise and honest responses, a limitation inherent in the use of self-reported information. Recall or biased reporting may have influenced subjects' responses.

2. Because subject recruitment and participation was on a voluntary basis, some segments of this adolescent population may possibly be under represented in terms of the

results of this study due to a lack of volunteers from certain segments.

3. Testing and participant recruitment was limited to classrooms made available to the researcher by each school.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

Promotion of regular physical activity and exercise has been important in order to influence health behaviors, especially those of adolescents who maintain below optimal levels of physical activity. However, adolescents as a group have been an under researched population in terms of the precursors of their physical activity participation and there remains little theory-based research on adolescents in the exercise literature (Reynolds et al., 1990). Similar to the adult exercise adherence literature, our understanding of exercise behavior in adolescents has not advanced at the pace needed to accelerate the rates of adoption and maintenance of exercise. In order to suggest directions for achieving improvement in adolescent activity behavior and ultimate health improvement, the use of behavior change models may help.

The Determinants of Adolescents' Activity Participation

Due to the importance of year-round participation in appropriate physical exercise, an orientation to physical activity and exercise that develops into sustainable adult activity patterns should be provided to children and youth. One essential and relevant question which must be addressed is: "What are the patterns or determinants of lifestyles during childhood that predispose individuals to a physically active lifestyle as adults?" (Seefeldt, 1985). The answer to this question provides knowledge of motivational determinants of activity participation and adherence among children and adolescents that is key to motivating children and youth to participate in activity and develop fitness patterns they will maintain throughout their lives (Rowland, 1986; Dishman & Dunn, 1988).

Sallis and Hovell (1990) have defined determinants as correlates of, or those factors that are associated with, participation in physical activity. Research conducted on the determinants of physical activity and exercise has attempted to explain and predict physical activity and exercise through these correlates or factors associated with physical activity participation. Determinants can help to explain why certain activity patterns exist and what might have to be changed in order to alter these patterns (Dishman, 1988). It is through this knowledge of physical activity and exercise determinants that a clearer understanding of activity and exercise behavior may be achieved to assist in designing interventions that effectively increase participation levels.

Barriers adolescents encounter which prevent, or are perceived to prevent them from participating in regular activity and exercise are important determinants to consider. Perceived barriers, a construct first introduced in conjunction with the Health Belief Model, has been subsequently used to successfully predict preventative health behaviors generally (Janz & Becker, 1984; Melnyk, 1988), and exercise behavior specifically (Slinker, Price, Roberts, & Jurs, 1984). Perceived barriers have also been considered in recent work applying Personal Investment Theory to the study of exercise patterns (Duda & Tappe, 1988). Ross, Dotson, and Gilbert (1985) found that seasonal changes are barriers that can influence the exercise behaviors of girls and younger children in particular. Time constraints have also been reported as a significant barrier to recruiting at-risk children into a structured exercise program (Rowland, 1986).

Tappe et al. (1989) considered each of the preceding barriers in developing a "barriers to exercise" scale. This study examined the perceived barriers toward exercise experienced by high school-aged males and compared to those of females. Results from this investigation suggest significant differences in perceived barriers to exercise among adolescent males and females who vary in physical activity and exercise levels. Importantly, high-active or low-active adolescent males and females differed in the overall degree of perceived barriers to exercise. Wanting to do other things with their time, lack of interest, unsuitable weather, school work, lack of equipment or facilities, and job responsibilities were the primary barriers to exercise among adolescents in general. The most important barriers to exercise among males included having a girlfriend and the use of alcohol and other drugs. Wanting to do other things with their time was the most important barrier among females. The barriers of having a girlfriend and the use of alcohol and other drugs distinguished highly active males from highly active females, who attributed school and school work as key barriers.

Other determinants of children and youth participation in physical activity and exercise consist of a myriad of environmental, parental, and intra personal influential factors. Anderssen and Wold (1992) found that the most important determinant of physical activity and exercise among adolescents was direct parental help and encouragement in exercising. Influence from peers was also positively related to students' activity levels. Influence from parents and friends on adolescents' self-reported level of physical activity was examined through measures of perceived leisure time physical activity of parents and best friend, perceived direct support for physical activity from parents and friends (verbal feedback, financial support, etc.), direct help from parents in exercising vigorously (exercising with them, being spectators, etc.), and perceived value of physical activity of parents and friends.

Socioeconomic status has also been positively correlated with children's physical activity (Gottlieb & Chen, 1985; Shephard & Godin, 1986; Sunnegardh, Bratteby, & Sjolin, 1985). Studies on the relationship between physical activity, knowledge, and behavior in youth suggest that knowledge of 'how to' be physically active may be a significant influence (Gottlieb & Chen, 1985) and, during adolescence, prior experience with physical activity or early socialization towards physical activity and exercise have significant influence upon intentions to exercise (Shephard & Godin, 1986). The determinants that have been most strongly associated with or predictive of the physical activity and exercise of adolescents are self-efficacy regarding physical activity and exercise (i.e., confidence in one's abilities) (Reynolds et al., 1990), intentions about exercise (Godin & Shephard, 1986; Greenockle, Lee, & Lomax, 1990; Ferguson, Yesalis, Pomrehn, & Kirkpatrick, 1989), and satisfaction with one's sport skills (Butcher, 1983).

Physical activity and exercise participation has been associated with a variety of variables. The majority of these variable associations do not necessarily demonstrate causal relationships. Also, studies investigating these determinants have not considered the process of exercise and physical activity acquisition and maintenance. Sallis and Hovell (1990) suggested that the determinants of participation are likely to be different for the various transition points in physical activity and exercise involvement. They have suggested that the determinants of adopting exercise and physical activity may be dissimilar to those involved in maintenance of physical activity and exercise participation as in the resumption of involvement after dropping out. Unfortunately the adolescent exercise determinant literature has, for the most part, focused upon the maintenance of activity while the study of adoption or resumption of physical activity and exercise participation has been left largely untouched. By contrasting environmental, social, cognitive, and physiological variables and their strengths on the adoption, maintenance, and resumption of exercise, yet-to-be-discovered information may help in designing more appropriate interventions (Sallis & Hovell, 1990).

Physical Activity and Exercise Intervention Strategies

Attempts to intervene and increase physical activity and exercise initiation and maintenance have been studied in numerous ways. In general, two broad approaches have been taken toward promoting physical activity and exercise: (1) individual and small-group, behavioral and cognitive-change strategies, and (2) promotion and change through mass-media social-psychological strategies (Brawley & Rodgers, 1993).

At the individual level, behavior-change strategies and interventions have ranged in research design and have received far more attention in the psychological exercise literature than mass-media social-psychological strategies. A number of authors have compiled evidence about efforts geared to individual physical activity and exercise promotion (Brawley & Rodgers, 1993; Godin & Shephard, 1990; Knapp, 1988; Wankel, 1987).

Various behavioral and cognitive-behavioral management techniques that have been used to increase exercise and physical activity have included such strategies as structured social support (Wing, Marcus, Epstein, & Jawad, 1991), decision-making strategies (Kendzierski, 1990), self-efficacy enhancement (Rodgers & Brawley, 1991), reinforcement strategies (Kravitz & Furst, 1991), health education (Nahas, 1985; Mirotznik, Speedling, Stein, & Bronz, 1995), modelling (Bandura, 1986), motivation enhancement (Wankel, 1987), and self-monitoring (Martin et al., 1984). Many of these various management techniques have produced modest but encouraging results in that they have produced elevated short-term levels (10 to 25% increase in frequency) of physical activity and exercise among small groups (Dishman, 1991). Refer to Dishman (1991) for a complete review of these and other studies on behavior management strategies.

Though several of these approaches have been developed and some positive results attained, there is still little known as to exactly how one should intervene in a particular population to increase the proportion of individuals interested in initiating or maintaining regular levels of physical activity and exercise. Although numerous intervention strategies have shown positive results, no one intervention or combination of strategies have been found to be consistently superior to others, or effective for all individuals (Dishman, 1991). The impact these strategies have on change in intensity and duration of activity also remains unclear.

Further to this, many of these individual behavior and cognitive behavioral-management techniques have resulted most consistently in only short-term enhanced levels of exercise and physical activity participation. Research has documented, across a wide variety of populations, that approximately half of the individuals who formally join an exercise program, will drop out during the first three to six months (Dishman, 1988b). To make matters worse, relapse prevention strategies are not well investigated. From the few studies undertaken in this area (Belisle, Rosies, & Levesque, 1987; Martin et al., 1984), some positive elevations in exercise and physical activity maintenance have accrued through relapse prevention strategies. Such strategies have included educating the individual regarding the process of relapse, identifying high-risk situations, improving coping responses, planning for slips, and preventing and coping with urges to lapse (Knapp, 1988). Refer to Knapp (1988) for further description of relapse prevention models.

Dishman (1991) suggested, that in order to improve the effectiveness of interventions designed to elevate physical activity and exercise participation at the individual level, intervention strategies must become more theory-driven and consider adherence to physical activity and exercise as a variety of stages appropriate to the individual (Brawley & Rodgers, 1993; Knapp, 1988; Prochaska & Marcus, 1994). The majority of exercise programs have been based upon action-orientated behavior change models and have been designed for people who have already decided to begin or continue in an exercise program, yet a large proportion of the North American population participates in virtually no exercise and likely have little interest in making that decision to start exercising. However, there are many steps that precede and follow a person taking action toward modifying a problem behavior. This mismatch between current offerings (action-oriented programs) and the condition of the population (not exercising and probably not interested in exercise) indicates that successful interventions must be tailored to the needs of the population of interest (Prochaska & Marcus, 1994). Trying to decide how to best help someone to change includes taking into account where a particular person is in the cycle of change.

It has also been suggested that in order to improve upon the effectiveness of interventions to elevate physical activity participation and maintenance, intervention research should move towards combining theories rather than contrasting them (Armstrong, Sallis, Hovell, & Hofstetter, 1993). Research on physical activity acquisition and maintenance may be better served by investigating combinations of strategies rather than continuously contrasting strategies against one another. Each strategy is seemingly bound to have inherent theoretical currents of both a positive and negative nature brought out by the continuous contrasting of these strategies against one another. By investigating combinations of these strategies, a greater emphasis and concentration would be placed on the positives of each strategy and how well they work together to explain exercise acquisition and maintenance, rather than a focus on the negatives or weaknesses of each strategy. This greater emphasis on the strengths of each strategy in combination would lead to more successful interventions (O'Connor, 1994).

Similar to the intentions of individualized promotion strategies, the goal of mass change is to encourage initiation and maintenance of physical activity and exercise involvement. Where the mass change approach differs is in the goal of trying to influence large numbers of specifically targeted people at one time (Brawley & Rodgers, 1993). The use of mass media communications to attempt to influence people to be more involved in physical activity and exercise is also characteristic of the mass change approach. The "Participaction" program in Canada is a specific and significant example of a mass change strategy. In terms of the effectiveness of mass change strategies, the impact of such campaigns seems to have been mainly in creating public awareness (Wankel, 1987), but not directly in increasing physical activity and exercise involvement (Brawley & Rodgers, 1993).

There are a few reasons why such campaigns may not be promoting an increase in physical activity and exercise involvement. Mass approaches tend to emphasize the general rather than specific concepts and consequences and it seems expected that the individual intuitively transfer the general message consequences into something more personally relevant (Brawley & Rodgers, 1993). However, Knapp (1988) and Olson and Zanna (1987) have pointed out that the relationship between such general concepts or beliefs that these campaigns promote and the individual's behavior is weak. Therefore, this focus on the general consequences and concepts does not help the individual to personalize the message being transmitted.

Mass change exercise promotion messages also do not encourage an increase in perceived behavioral control (Brawley & Rodgers, 1993). More specifically, individuals who are initiating physical activity and exercise or those who are resuming their involvement after a sedentary period need to feel as though they have the ability to organize their time, have the necessary skills, and have the ability to take control over other parts of their lives in order to be active. However, mass change approaches have rarely addressed these how-to aspects of either physical activity and exercise or how to plan and make time for it. Because of this lack of information, individuals are left to decipher how to accomplish the task of initiating physical activity and exercise on their own. McCauley (1992) suggested that those individuals who are not overly self-efficacious about their ability to carry out this task are unlikely to become involved.

Generally, the mass change approach, because of its focus on education rather than a behavioral or motivational focus, has been ineffective in stimulating large numbers of people to initiate physical activity and exercise. Furthermore, many individuals receiving the message may already be active or seriously considering the idea of participating in regular physical activity and exercise. This is similar to the conceptual idea of "preaching to the converted".

Like individualized strategies, many of the mass change exercise initiatives have also been designed for people who have already decided to begin regular exercise and physical activity, yet it is known that a large proportion of the population have yet to make the decision to exercise and are likely to have little interest in doing so. This again reflects the mismatch between what is currently being offered (action-oriented initiatives) and where a majority of the population is regarding readiness to change (sedentary and disinterested in exercise). Consequently, interventions that are tailored to the specific needs of the population of interest (i.e., the very sedentary) would seem more logical because obviously the historical 'mismatch' has not been all that effective.

Theoretical Models in Physical Activity and Exercise Promotion

Little is known about the process by which physical activity and exercise habits are developed, since most published studies have been conducted without reference to any theoretical model (Dishman, Sallis, & Orenstein, 1985). Utilizing theory-driven research on the determinants of, and interventions for, physical activity provides a framework for understanding, predicting, and changing behavior (Marcus, 1995). The lack of theory-driven research on physical activity and exercise determinants and interventions has thus led to erroneous conclusions (Godin & Shephard, 1990). Even if an atheoretical program has apparently achieved success, the reasons underlying the accomplishment have tended to remain obscure, making it difficult to generalize tactics to other target populations. Consequently, there is need to study the determinants of exercise and physical activity habits using accepted models of human behavior.

The most popular models that have adopted a theoretical attitude-behavior framework for the analysis of physical activity and exercise behavior include the Health Belief Model (Becker, Haefner, Kasl, Kirscht, & Maiman, 1977; Rosenstock, 1974; Slinker et al., 1985), Protection Motivation Theory (Rogers, 1975; Wurtele & Maddux, 1987), Social Cognitive Theory (Bandura, 1977a, 1977b, 1986; Sallis, Hovell, Hofstetter, Faucher, & Elder, 1989), the Theory of Reasoned Action (Daltroy & Godin, 1989; Fishbein & Ajzen, 1975; Godin & Lepage, 1986), the Theory of Interpersonal behavior (Triandis, 1977), and the Theory of Planned Behavior (Ajzen, 1985; Ajzen & Madden, 1986). There is an incorporation of physical activity and exercise participation aspects in each of these models. Unfortunately the involvement in activity has been treated by each model as an all-or-none, dichotomous state, where the maintenance of participation has been the focus. The dynamic, continuous process of behavior change and the adoption and resumption of physical activity and exercise have once again been, for the most part, left unheeded (Dishman, 1994).

Process-oriented theories and interventions targeted towards the specific characteristics of individuals may help the further identification of the differences between individuals that facilitate or repress participation in physical activity or exercise. This may accelerate the adoption and maintenance of physical activity and exercise through the matching of these differences within interventions. One model that has recognized the dynamic nature of change an individual progresses through and the cognitive and behavioral processes they use while changing behavior is the Transtheoretical Model (Prochaska & DiClemente, 1985). The Transtheoretical Model has been applied to physical activity and exercise and it has been suggested that this model can be useful in understanding physical activity and exercise participation (Dishman, 1994; Sonstroem, 1988).

The Transtheoretical Model

The Transtheoretical Model of change, developed by Prochaska, DiClemente, Velicer, and colleagues offered an alternate conceptualization of the structure of behavior change. The model's focus is on the phenomena of intentional change, as opposed to societal, developmental, or imposed change (Grimley, Prochaska, Velicer, Blais, & DiClemente, 1994). Further to this, unlike many other models of behavior change, this model has been shown to focus on both actual behavior and behavioral intention (Marcus, Pinto, Simkin, Audrain, & Taylor, 1994).

The Transtheoretical Model is also an attempt at a more comprehensive explanation of how individuals go about changing behaviors. In other words, this model provided a synthesis of the diverse models of change and a framework for integrating them. Dishman (1991) maintained that the Transtheoretical Model has the potential and capacity to bridge the use of behavior modification and cognitive-behavior modification traditions. As well, the Transtheoretical Model represented an attempt to cover the full course of change, from the time someone becomes aware that a problem exists to the point in time where the problem behavior has been modified and the new behavior maintained.

The real particular strength of the stages of change model is its focus on the dynamic way in which individuals change their behavior. Dynamic models that focus on the different progressions in adoption and maintenance of exercise have been recommended by exercise researchers (Blair, Powell, & Bazzare, 1993; Dishman, 1982; Sonstroem, 1988). The Transtheoretical Model is considered dynamic for two reasons. First, the model proposes that individuals at different stages respond to different processes. Second, the model acknowledges the commonality of relapse by people attempting to change a behavior (O'Connor, 1994, p.5).

Because this model is so dynamic, it is possible to specifically examine the different transitions in adoption and maintenance of physical activity and exercise. This model rejects the notion that the change of behavior is an all-or-nothing phenomenon (Sonstroem, 1988). It is conceivable that those individuals who stop performing a behavior may intend to start again, therefore change is viewed as a process, rather than a dichotomous state of either exhibiting or not exhibiting the behavior of interest. As a dynamic model, the Transtheoretical Model is consistent with aspects of many learning and social/cognitive theories of behavior change such as those of Skinner (1953) and Bandura (1977a;1977b).

Exercise researchers such as Sonstroem (1988) have also recommended that this model be applied to exercise behavior because, in their view, the exercise field requires a shift from a reliance on predictive models to the use of process models that may aid in the understanding of behavior change (Marcus, Rakowski, et al., 1992). Dynamic models such as this described by Dishman (1991) and Sallis and Hovell (1990) are additionally important since exercise is a dynamic behavior and it is essential that the different transitions in the adoption and maintenance of exercise behavior receive study (Marcus, Rakowski, et al., 1992).

Another particular strength of the Transtheoretical Model is that the model can be applied successfully to a wide variety and range of health behaviors. Though the model originated out of the smoking cessation research and has been most thoroughly applied in the addictive behaviors (Prochaska & DiClemente, 1985), the underlying constructs of this model that are important for understanding change are quite similar across a broad diversity of problem behaviors (Prochaska, Velicer, Rossi, Goldstein, Marcus, Rakowski, Fiore, Harlow, Redding, Rosenbloom, & Rossi, 1994). The Transtheoretical Model is a "template" of sorts in that it is translated or redefined across different problem behaviors. The model consists of general constructs and constructs specific to the problem behavior, which usually requires either minor or major changes in the wording of the measures used in the assessment of these constructs (Grimley et al., 1994, p.203). This further demonstrates the potential of this model to provide a broad theoretical orientation from which to understand and promote and promote physical activity and maintenance (O'Connor, 1994).

Stages of Change

The Transtheoretical Model suggests that individuals who engage in a new behavior, attempt to make a behavior change, or struggle to reduce or remove a problem behavior move through a series of stages. The core of the model is a sequence of stages along a continuum of behavioral change from Precontemplation (not intending to make changes), to Contemplation (considering a change), to Preparation (making small changes), to Action (engaging in the new behavior actively), to Maintenance (sustaining the change over time) (see Table 1).

Table 1
Definition of the Stages of Change

STAGE	DEFINITION
Precontemplation	Period in which the individual is not thinking of making the targeted behavioral change within the next six months.
Contemplation	Period of time in which the individual is seriously thinking of making the targeted behavior change within the next six months.
Preparation	Period of time in which the individual is seriously thinking of making targeted behavior change in the next month. Individuals may exercise some but not regularly in this stage.

Action	Period from behavior change for six months following the change when the behavior change is maintained.
Maintenance	Period from six months post behavior change onward that the behavior change is maintained.
Relapse	Any point following a behavior change when behavior reverts to one of the earlier stages.

-From Marcus & Simkin, 1993.

Early research by Prochaska and DiClemente (1982; 1983) identified behavior change occurring along a linear pattern of four stages comprised of Precontemplation, Contemplation, Action, and Maintenance. More recent research has supported the proposition that movement through these stages of behavior does not always occur linearly as the possibility does exist that relapsing back to an earlier stage may occur. Change is hypothesized to occur in a cyclical or spiral pattern rather than a linear pattern because many individuals must make several attempts at behavior change before they can realize their goals (Prochaska, DiClemente, & Norcross, 1992) and because of how common relapse is to behavior change (Marlett & Gordon, 1985). As well, progress through these stages of behavior occurs at varying rates, with some individuals remaining "stuck" in certain stages, while others progress forward or relapse to earlier stages (Marcus, Pinto, et al., 1994). The addition of the fifth stage of change (Preparation) was added between Contemplation and Action after the re-assessment of data collected in original research studies (DiClemente, Prochaska, Velicer, Fairhurst, Rossi, &Velasquez, 1991).

The notion of stages also suggests that individuals pass through each of the stages and cannot successfully leap from an early stage to a later non-adjacent one. Prochaska, DiClemente, Velicer, and Rossi (1992) predicted that individuals who leap to modifying a behavior without adequately thinking it through or developing a plan of action are at a high risk for relapse (i.e., from Precontemplation to Action).

The stage concept also encompasses both behavior and behavioral intention. The stages of change model incorporates both how an individual is currently behaving and how they intend to behave. Stages therefore provide a helpful theoretical framework for understanding chronic behavioral risk factors like sedentary lifestyles, smoking, and high fat diets (Marcus & Simkin, 1994).

In a study comparing smokers quitting on their own with smokers in two smoking cessation treatment programs (Prochaska & DiClemente, 1982), the stages were first identified. They were further developed and operationalized with a sample of outpatient therapy clients (McConnaughy, Prochaska, & Velicer, 1983). Application of the Transtheoretical Model to physical activity and exercise was initially conducted at the University of Rhode Island (Sonstroem, 1988). Based on the self-report exercise histories over the past four years of 220 males 30 years of age or older, a major discriminant function produced a canonical r of .75 with stage of exercise adoption, along with a correct overall classification of 67.9%. Accuracy of staging was also consistent across stages ranging from 28.1% above baseline for recruits to 47.2% above baseline for adherers.

Marcus and colleagues have continued to further the measurement development and model testing in the area of exercise adoption and maintenance. Scales to measure stages of change for exercise have been developed (Marcus, Selby, et al., 1992). Instruments to measure stage of change were developed, refined, and validated using adults participating in two work site health promotion projects. These two work-site samples (n=1,063 and n=429) were employed to determine prevalence information on their stage of adoption measure. This measure initially contained four items, using a five point Likert scale (1 = strongly disagree to 5 = strongly agree) to rate each item. Marcus, Selby, et al. (1992) initially defined the stages as follows:

1. Precontemplation - I currently do not exercise and do not intend to start exercising in the next six months.
2. Contemplation - I currently do not exercise but I am thinking about starting to exercise in the next six months.
3. Action - I currently exercise some, but not regularly.
4. Maintenance - I currently exercise regularly.
5. Relapse - I have exercised regularly in the past, but I am not doing so currently.

*(Regular exercise was defined as participating in exercise three or more times per

week for at least 20 minutes each time).

Staging of each item was done by placing the subject into the stage that they endorsed most strongly. Those subjects who did not strongly agree or disagree with any of the items were not classified into a stage. In the first study subjects did not evenly distribute themselves across the stages as many of the subjects tended to stage themselves into Action or Maintenance. Relapse did not emerge as a distinct stage. As a result, the relapse stage was eliminated, a Preparation stage was included, and time referents to Action and Maintenance were added into their definitions. The stages became defined as follows:

1. Precontemplation - I currently do not exercise and do not intend to start exercising in the next six months.
2. Contemplation - I currently do not exercise but I am thinking about starting to exercise in the next six months.
3. Preparation - I currently exercise some, but not regularly.
4. Action - I currently exercise regularly, but have been doing so for less than six months.
5. Maintenance - I currently exercise regularly and have been doing so for more than six months.

This measure and definition of the stages more clearly differentiated the subjects according to stage and a Kappa index of reliability of .78 over a two week period was demonstrated. In the two samples 34-39% of employees were regularly participating in physical activity (Action or Maintenance) and 66-61% of employees were not regularly participating in physical activity (Precontemplation, Contemplation, or Preparation). Seven percent of this sample could still not be staged. It was suggested that in order to further the percentage of subjects that could be classified into a stage, measures of stages should include a yes/no format.

The construct validity of this measure has also received support. Marcus and Simkin (1993) demonstrated the stage of change measure's concurrent validity by its association with the Seven Day Physical Activity Recall Questionnaire. Subjects from this sample (n=235) were asked to answer a stages of exercise behavior questionnaire and the seven day physical activity recall questionnaire. More moderate and vigorous physical activity in the Action/Maintenance stages compared to those in the Precontemplation/Contemplation stages were reported. Levels of self-reported vigorous physical activity significantly related to one's stage of exercise behavior (F(2,218)=20.57, p<.001). Subjects in Action/Maintenance reported significantly more minutes of vigorous activity than subjects in Preparation and Precontemplation/Contemplation. Results also revealed that 51% of employees were participating in no exercise (Precontemplation and Contemplation) and 49% were participating in occasional or regular exercise (Preparation, Action, and Maintenance).

This stage of change measure has also been shown to consistently relate to the process of change (Marcus, Rossi, et al., 1992), decision-making and self-efficacy (Marcus & Owen, 1992; Marcus, Rakowski, et al., 1992), supporting further the construct validity of the stage of change measure for exercise.

Processes of Change

The Transtheoretical Model also includes the processes of behavior change an individual may use to progress through the stages of behavior change. The processes of change are the cognitive, affective, and behavioral strategies and techniques that people use as they progress through the different stages of behavior over time (Prochaska & DiClemente, 1983) and different change processes are emphasized at the various stages of behavior change (DiClemente et al., 1991). Use of the processes of change depends strongly on the individual's current stage of behavior (Prochaska & DiClemente, 1983). Processes of change may also be considered as the covert or overt activities that individuals use to modify their experiences and environments in order to modify or change their behavior.

The change processes were first identified theoretically in a comparative analysis of the leading systems of psychotherapy (Prochaska, 1979). The processes were selected by examining recommended change techniques across different theories hence explaining the term 'transtheoretical' (Grimley et al., 1994). Prochaska suggested that although there were many different psychotherapies, there were essentially ten basic processes to modify behavior: consciousness raising, dramatic relief, self-reevaluation, social reevaluation, social liberation, environmental reevaluation, relationship fostering, counter conditioning, contingency management, and stimulus control. The processes and their definitions in relation to exercise are provided in Table 2.

Table 2
Processes of Change: Definitions and Internal Consistencies

PROCESS	ALPHA	DEFINITION
Experiential Processes:		
Consciousness Raising	.84 & .84	Efforts by the individual to seek new information and to gain understanding and feedback about exercise.
Dramatic Relief	.88 & .87	Affective aspects of change, often involving intense emotional experiences related to the problem behavior.
Environmental Reevaluation	.82 & .81	Consideration and assessment by the individual of how inactivity affects the physical and social environments.
Self-Reevaluation	.89 & .88	Emotional and cognitive reappraisal of values by the individual with respect to inactivity.
Social-Liberation	.62 & .62	Awareness, availability, and acceptance by the individual of alternative, problem-free active life styles in society.
Behavioral Processes:		
Counter Conditioning	.84 & .82	Substitution of alternative behaviors for inactivity.
Helping Relationships (Relationship Fostering)	.82 & .84	Trusting, accepting, and utilizing the support of caring others during attempts to become active.
Reinforcement Management (Contingency Management)	.82 & .80	Changing the contingencies that control or maintain a sedentary lifestyle.
Self Liberation	.81 & .72	The individual's choice and commitment to change the problem behavior, including the belief that one can change.

Stimulus Control	.73 & .71	Control of situations and other causes that trigger and support inactivity.

-From Marcus, Rossi, et al., 1992.

These ten processes are organized in a hierarchical manner consisting of two higher-order constructs; the experiential and behavioral processes (Prochaska, Velicer, DiClemente, & Fava, 1988). The experiential construct includes the first five processes (Consciousness Raising, Dramatic Relief, Environmental Reevaluation, Self-reevaluation, Self-liberation) and the behavioral construct incorporates the last five processes (Counterconditioning, Helping Relationships, Reinforcement Management, Self Liberation, and Stimulus Control) (see Table 2). The experiential processes are seen as more important than behavioral processes for understanding and predicting progress in the early stages of behavior change (DiClemente, Prochaska, Velicer, et al., 1991). Whereas, the behavioral processes are more predictive of transitions from preparation to action and from action to maintenance (Prochaska & Marcus, 1994).

Marcus, Rossi, et al. (1992) developed and administered a process of change questionnaire to participants (n=1,172) in a work-site health promotion project. This sample was randomly split into halves for initial model development, testing, and confirmatory measurement model testing. The purpose of these analyses was to identify the change processes for exercise adoption and to produce a reliable questionnaire that measured these processes of change. A 39 item questionnaire was developed, with statements representing each of the ten processes of change. Using a five-point Likert scale, subjects were asked to think back over the past month and rate the frequency of occurrence (1 = never to 5 = repeatedly) of each item. The reported alphas for each of the ten processes of change ranged from .62 to .89 (see Table 2).

Subjects from the Marcus, Rossi, et al. (1992) study used all ten processes of change hypothesized by the Transtheoretical Model. The processes were also found to be organized into two higher order constructs, namely experiential and behavioral (see Table 2). As well, subjects in different stages of change used the processes of change in significantly different ways. Generally, during exercise behavior change, people in Precontemplation used the processes of change significantly less than all other stages. The use of experiential processes did not differ between Contemplation and Preparation, but individuals in Preparation tended to use the behavioral processes to a larger extent compared to those in Contemplation. During Action, experiential and behavioral processes were employed more frequently than during Preparation. Finally, individuals in Maintenance made less use of the experiential processes and greater use of the behavioral processes than those in Action. Results of this study supported the use of all ten processes of change proposed by the Transtheoretical Model and further validated the proposal that this model may be applied to the study of exercise adoption and maintenance.

An integration of the stages and processes of change has been shown through research to be a useful guide for interventions (Marcus, Banspach, et al., 1992). Results have suggested that to accelerate progress through the stages of a certain behavior, thereby increasing the adoption of exercise behavior and improvement of maintenance of that behavior, treatments should be tailored to the processes of change used by an individual. Once an individual's stage has been assessed, counsellors have a better idea of which processes to emphasize within the intervention in order to assist progress to the next stage (Marcus & Simkin, 1994).

In a community intervention study, Marcus, Banspach, et al. (1992) utilized the stages of change and processes of change model (Transtheoretical Model) to design an intervention to increase the adoption of physical activity among 610 community volunteers. At baseline, 39% of subjects were in Contemplation, 37% were in Preparation, and 24% were in Action. A six week stage and process matched intervention consisting of three different sets of self-help materials, a resource manual describing activity options, weekly fun walks, and activity nights were delivered. A stratified (by baseline stage) random sample of participants (n=236) were telephoned post-intervention. Results revealed that 17% of subjects were in Contemplation, 24% were in Preparation, and 59% were in Action, demonstrating that subjects had become significantly more active during intervention by progressing along the continuum toward Action.

Decisional Balance

The Transtheoretical Model also ties itself closely to an outcome or intermediate variable that includes decisional balance or the pros and cons of behavior change (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). Jannis and Mann (1968; 1977) described the process of decision making using a Decisional Balance Sheet to assess costs and benefits of behaviors to self and others. This decision-making process was found to be highly related to current and future likelihood of participating in health behavior change, such as starting exercise (Marcus & Owen, 1992; Marcus, Selby, et al., 1992), quitting smoking (Velicer et al., 1985), and losing weight (O'Connell & Velicer, 1988).

Decisional balance is based on a comparison of the perceived positive aspects (pros) and negative aspects (cons) of a new behavior. Persons in Action and Maintenance tend to have a decisional balance favouring the positive features (pros) or the benefits of a behavior, where the benefits outweigh the costs; for those persons in Precontemplation and Contemplation more costs (cons) of a behavior than benefits tend to be perceived; and persons in Preparation tend to fall between those in Precontemplation/Contemplation and Action/Maintenance where the costs (cons) and benefits (pros) of a behavior are in balance (Marcus & Owen, 1992; Marcus, Rakowski, et al., 1992).

In a cross-cultural study Marcus and Owen (1992) examined the prevalence of stages of readiness to exercise and their relationship to the costs and benefits of exercising in samples of 1,093 United States employees and 801 Australian employees. In both samples, 41% of the subjects were in Precontemplation or Contemplation and 59% were in Preparation, Action, or Maintenance. A six-item decisional balance measure, composed of a 3-item "pro" scale which measured the benefits of exercising and a three-item "con" scale which measured the costs of exercising, was used. Additionally, a decisional balance index was calculated by subtracting the sum of the con scale from the pro scale. A five-point Likert scale (1= 'not at all important' to 5 = 'extremely important') was used to rate each of the five self-efficacy items. This measure was used to assess decisional balance in both sample studies.

In both samples, scores on the decisional balance scales were significantly related to stage. In study one (n=1,093) internal consistency was .70 (n=1082) for the pro items, and .56 (n=1,088) for the con items. Significance was found for the total scores on the pro scale, (F[4,1034]=36.04, p<.001), the con scale (F[4,1039]=35.86, p<.001), and the overall decisional-balance index (F[4,1034]=61.59, p<.001). In study two (n=801) internal consistency was .70 (n=772) for the pro items and .43 (n=769) for the con items. Significant differences between the stages were found for total scores on the pro scale (F[4,751]=23.71, p<.001), the con scale (F[4,751]=23.71, p<.001), and the decisional-balance index (F[4,747]=30.80, p<.001). In both samples, Precontemplators were significantly different from those in all other stages. Precontemplators scored the lowest and those in Maintenance scored the highest on the pro and decisional-balance indices, with the pattern reversed on the con scale.

In the application of the Transtheoretical Model to exercise behavior among employed women, Marcus, Pinto, et al. (1994) examined the relationship between the stages of change model and the decisional-balance model to help understand exercise behavior in women. Four hundred and thirty one women at three work sites volunteered to participate in this study. The stages of exercise adoption measure utilized in three previous exercise studies (Marcus, Eaton, Rossi, & Harlow, 1992; Marcus & Owen, 1992; Marcus, Rakowski, et al., 1992) was used as well as the six-item decisional balance measure described previously (Marcus & Owen, 1992). In this sample (n=431) internal consistency was found to be .67 for the pro items and .51 for the con items.

Analyses regarding stage of adoption revealed that 8.2% of female employees were in Precontemplation, 30.4% were in Contemplation, 33.9% were in Preparation, 12.4% were in Action, and 15.1% were in Maintenance. Mean scores on the pro scale differentiated women at different stages (F[4,374]=14.06, p<.001), as well as the con scale (F[4,374]=22.8, p<.001), and the overall decisional-balance index (F[4,398]=29.05, p<.001). Precontemplators were found to be significantly different from those in all of the other stages. Precontemplators scored the lowest and those in Maintenance scored the highest on the pro and decisional balance indices, with the pattern reversed on the con scale.

Marcus, Rakowski, et al. (1992) developed a decisional balance measure for exercise similar to that used for smoking cessation (Velicer et al., 1985). In a sample of 778 participants recruited from five work sites, Marcus, Rakowski, et al. (1992) asked subjects to answer a 40 item questionnaire comprised of items reflecting positive and negative aspects of exercise. In a principal component analysis, two factors were identified: one a 6-item component representing avoidance of exercise (cons), the other a 10-item component representing positive perceptions of exercise (pros). Coefficient alpha internal consistency reliabilities were satisfactory at .79 and .95 respectively. Analysis of variance showed that Pros, Cons, and a Decisional Balance measure (pros minus cons) were significantly associated with stage of exercise adoption. Differences on the Pro scale by stage of adoption were significant, F(4,712)=34.84, p<.0001, r squared = .16. Differences on the Con scale by stage adoption were also significant, F(4,710)=25.31, p<.0001, r squared = .12. Lastly, the Decisional Balance analysis also achieved significance, F(4,709)=49.32, p< .0001, r squared = .22.

Results showed that those in Maintenance and Action, when compared to Precontemplation and Contemplation, exhibited significantly higher Pro scores. Pro scores were also significantly higher for subjects in Action compared to Preparation, and in Preparation and Contemplation compared to Precontemplation. Con scores were significantly lower for all stages when compared to Precontemplation, in Maintenance compared to Action, Preparation, and Contemplation, and in Action compared to Preparation. These results are consistent with applications of the model to smoking cessation and other areas of behavior change.

Gorley and Gordon (1995) examined the relationship between stage of change and decisional balance among adults aged 50 - 65 years (n=583). Stage of change was assessed using the stage of change measure developed by Marcus, Selby, et al. (1992). Decisional balance was measured using the 16-item decisional balance questionnaire developed by Marcus, Rakowski, et al. (1992). Analysis regarding stage of adoption revealed that 14.6% of these adults (n=583) were in Precontemplation, 9.6% were in Contemplation, 29% were in Preparation, 9.4% were in Action, and 37.4% were in Maintenance. Results of a 13 dependent variable multiple analysis of variance, where stage of change served as the independent variable, showed that both pros and cons made a significant and unique contribution to discrimination between the stages at the $p<.05$ level.

The MANOVA main effect for stage was significant, Wilk's Lambda =.422, F(48,1890)=9.88, $p<.001$. A follow-up stepwise discriminant function analysis, with significance for entry set at $p<.05$, showed that eight of the thirteen predictor variables made significant and independent contributions to the discrimination among stages, Wilk's Lambda =.432, F(4,32)=14.58, $p<.001$. The pro and con scales were two of these eight variables that contributed to the discrimination among stages. Post hoc analysis showed Precontemplators scoring lowest on the pros index and Maintainers scoring highest. On the con scale, Maintainers scored lower than those in Preparation, Contemplation, and Precontemplation. Those in Action and Maintenance were not significantly different from each other on the cons index.

Self-Efficacy

The Transtheoretical Model also ties itself closely to self-efficacy theory. In fact, stage of behavior change has been shown to be so clearly and closely related to self-efficacy beliefs that self-efficacy has been integrated into the Transtheoretical Model as an outcome or intermediate variable (DiClemente, Prochaska, & Gibertini, 1985). Self-efficacy theory posits that one's ability to perform a given behavior is strongly related to one's confidence in their ability to perform that behavior (Bandura, 1977). In other words, it is hypothesized that those who exhibit higher engagement in a given behavior would tend to have a higher self-efficacy or confidence in their ability to engage in that activity. It appears that scores on a specific self-efficacy measure are related to stage of change, with Precontemplators and Contemplators scoring lowest and those in Maintenance scoring highest, although clear differentiation between all stages has not yet been established (DiClemente et al., 1985). The stages of exercise behavior measure developed by Marcus and colleagues has been found to be significantly related to an individual's self-efficacy for exercise in most instances.

In the development of the stages of exercise questionnaire scale, the Marcus, Selby, et al. (1992) study reported previously also developed a questionnaire measuring exercise self-efficacy using two separate samples. A five-item self-efficacy measure was designed to measure confidence in one's ability to persist with exercising in various situations. In study one (n=1,063), subjects were asked to use an 11-point scale to rate each item with one being 'not at all confident' and eleven being 'very confident'. The five-item self-efficacy measure internal consistency was .82 (n=917). Further results revealed that total scores on the self-efficacy item differentiated employees at different stages (F[3,861]=85.93, p<.001). Proportion of variance accounted for was .23. Precontemplators were significantly different from subjects in all other stages. A clear pattern emerged with Precontemplators scoring lowest and Maintainers scoring the highest on the self-efficacy measure. No other significant differences between stage of change and self-efficacy were reported.

In study two (n=429), the scale ranges on the self-efficacy items were changed from 1-11 to 1-7 as a result of feedback from subjects and a desire to improve response clarity. The internal consistency for this five-item measure was.76 (n=388). Total scores on these items reliably differentiated employees at different stages (F[4,369]=36.57, p<.001). Proportion of variance accounted for was .28. Similar to study one, Precontemplators were significantly different from subjects in all other stages. All other comparisons were significant as well except between Contemplation and Preparation. Test-retest (product moment) reliability for this scale over a two-week period was.90 (n=20).

In the Marcus, Pinto, et al. (1994) study discussed previously within decisional balance, the relationship between stages of change and self-efficacy was also investigated. These 431 women were asked to respond to the five item self-efficacy measure used in a previous study (Marcus, Selby, et al., 1992). In this study (n=431), internal consistency was .84 for the self-efficacy measure. Mean scores on the self-efficacy items differentiated women at the different stages (F[4,374]=52.99, p<.001). Again, Precontemplators scored lowest and those in Maintenance scored highest on the self-efficacy index.

The Gorley and Gordon (1995) study among 583 adults aged 50-65 years also described earlier within the decisional balance examined the relationship between stages of change and self-efficacy for exercise as well. Self-efficacy was measured using the five-item self-efficacy measure questionnaire developed by Marcus, Selby, et al. (1992). Multiple analysis of variance showed that self-efficacy made a significant and unique contribution to discriminating between stages. Self-efficacy was shown to increase from Precontemplation to Maintenance. Post hoc analysis also revealed that subjects in Precontemplation were significantly different from those in Contemplation, Preparation, Action, and Maintenance, those in Contemplation were significantly different from those in Preparation, Action, and Maintenance, those in Preparation were significantly different from those in Maintenance, and those in Action were significantly different from those in Maintenance. Those in Preparation and Action were again not found to be significantly different from each other.

In the cross-sectional study reported previously within decisional balance, Marcus and Owen (1992) also examined the prevalence of stages of readiness to exercise and their relationship to self-efficacy in the two samples of 1093 American employees and 801 employees in Australia. Subjects were asked to answer a questionnaire including the stages of change measure and the five-item self-efficacy measure described previously (Marcus, Selby, et al., 1992). Items represented the areas of negative affect, resisting relapse, and making time for exercise. A seven point scale (1 = not at all confident to 7 = very confident) was used to rate each item.

In study one (n=1093) internal consistency for the five-item self-efficacy measure was .85 for the total sample completing the scale (n=1083). Total scores on the self-efficacy items differentiated employees at different stages, F(4,970)=115.84, p<.001. Tukey's post hoc comparisons of scores on the self-efficacy measure for subjects at the different stages of change revealed that in most cases, Precontemplators were significantly different from those in all other stages. A clear pattern emerged, with Precontemplators scoring the lowest and those in Maintenance scoring the highest on the self-efficacy index.

In study two (n=801) internal consistency for the five-item self-efficacy measure was .80 for the total sample completing the scale (n=773). Total scores on the self-efficacy items reliably differentiated employees at different stages, F(4,757)=40.38, p<.001. Similar to the findings of Study one, Precontemplators were significantly different from subjects in all other stages.

Summary

The Transtheoretical Model represents an integrative perspective that explains the structure that results when individuals attempt to change behavior. Though early research using the Transtheoretical Model focused on the extinction of addictive behaviors such as alcohol abuse, smoking, obesity, and drug addiction, the core constructs of this model have recently been applied to the study of the acquisition and maintenance of positive health behaviors such as exercise. The Transtheoretical Model has two major dimensions: stages of change and processes of change. As well, the Transtheoretical Model is closely connected with two other construct dimensions believed to influence behavior change: self-efficacy and decisional balance. The construct dimensions of processes of change, self-efficacy, and decisional-balance have been shown to be used differentially by stage of change in both the addictive and positive health behaviors within adult population samples.

Based upon this review, several recommendations may be made in regards to further research on the application of the Transtheoretical Model to the acquisition and maintenance of exercise behavior. Firstly, the scales used to measure stages of change for exercise require further refinement. As suggested by Marcus, Selby, et al. (1992), a stage of change measure including a yes/no format might be used in future studies. Secondly, examination of the application of the Transtheoretical Model in a broad selection of population samples is limited in the research on the Transtheoretical Model in the exercise domain. It is necessary to examine the Transtheoretical Model within a broad selection of population samples to gain a full understanding of the exercise adoption process as well as to determine if pattern of change and construct use is similar across the lifespan. Thirdly, in previous studies on the Transtheoretical Model and exercise behavior, there has been a tendency to perform analyses on the processes of change separately and independently of self-efficacy and decisional balance. By analysing all three constructs within a multivariate design, important information could be added to the current literature by allowing the relationships between these constructs to be examined. These recommendations were addressed within this study.

CHAPTER 3

METHODS AND PROCEDURES

Subjects

A sample of adolescents enrolled in a wide range of classes were recruited for participation in this study. Male and female students in the 10th, 11th, and 12th grades from eight schools within and around Edmonton participated in this study. Non-probability, availability sampling techniques were employed to recruit both schools and potential subjects.

The Research Design

This investigation was one of a cross-sectional, causal-comparative survey design. A description of how the total sample distributed itself on the response alternatives for each questionnaire item, along with an analysis of the relationships between all variables were explored. The independent variables of processes of change, self-efficacy for exercise, decision-making for exercise, and demographic characteristics were examined for their differential use and explanatory value for the dependent variable of adolescent exercise stage of change. The relationship between the stages of exercise behavior and self-reported time spent in physical activity or exercise was explored as well. Within this analysis the stage of exercise behavior served as the independent variable.

Data Collection

Subjects were asked to complete a questionnaire on exercise and basic demographic information (see Appendix A) during one of their scheduled class times. The instrumentation that was used had already been developed and discussed in the research (Marcus & Owen, 1992; Marcus, Rakowski, et al., Marcus, Rossi, et al., 1992; 1992; Marcus, Selby, et al., 1992; Marcus & Simkin, 1992). For data collection, high school subjects were contacted on two separate occasions. On the first occasion, potential subjects were informed of the intentions of the project and informed consent forms (see Appendix B) were distributed. On the second occasion, informed consent forms were collected and the questionnaire administered to those who provided informed written and parental consent.

The total amount of time that was required of subjects was approximately forty minutes. Approximately ten minutes was required for initial recruitment of participation from each subject, distribution of the informed consent forms, and an explanation of the purposes of the project and the extent of subject participation. The remaining thirty minutes was used for collection of the informed consent forms, review of project purpose and participant involvement, and finally, administration of the questionnaire. The questionnaire required approximately 20 minutes for completion. The instruments were administered in the order reflected in Appendix A.

Teachers of the classes that were surveyed were present during questionnaire completion. However, these teachers were not involved in either the questionnaire distribution, supervision, or interpretation and did not have access to their students' responses. The confidentiality and anonymity of subjects was assured by keeping all responses and personal information provided by the respondents kept in a locked filing cabinet and guaranteeing that only the principal investigators would have access to the personal information provided by respondents. Results of this study have been made public through publication and compilation of a written thesis. However, since all data collection has been completed, all subjects have been assigned a numerical code and their names have been discarded in order to assure each subjects' identity remains protected.

Measures

Stages of Exercise Behavior

A stages of exercise adoption measure, developed in four previous exercise studies (Marcus & Owen, 1992: Marcus, Rakowski, et al., 1992; Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992) was used. Questions designed to assess current stage of exercise were administered to all subjects (see Appendix C). Subjects were asked to mark YES or NO to each item. Precontemplation included subjects who had not exercised and did not intend to start exercising. Contemplation included subjects who had not been exercising, but intended to start exercising. Preparation included subjects who had exercised some, but not regularly (regular exercise being three or more times per week for 20 minutes or longer each time). Subjects in the Action stage had been exercising regularly, but had only done so for less than six months. Maintenance included subjects who had been exercising regularly for six months or longer. Subjects were placed into a stage based on their pattern of response to these questions and according to the instrument specifications (see Appendix C).

Reliability of this stage of exercise adoption measure has been examined. Test-retest reliability over a two-week period was reported as .78 (Marcus, Selby, et al., 1992). Concurrent validity for this measure has also been demonstrated by how significantly scores on the seven day Physical Activity Recall Questionnaire have differentiated subjects by stage (Marcus & Simkin, 1993). Univariate tests revealed a significant between group effect for total minutes of vigorous activity in the past week [F(2,218)=20.57, p<.001]. The univariate effect for total minutes of moderate activity was also significant [F(2,218)=9.09,<.001].

Processes of Exercise Adoption and Maintenance

A 40-item processes of exercise behavior measure previously developed (Marcus, Rossi, et al., 1992) was administered (see Appendix D). This measure consisted of ten change processes, with each process being represented and assessed by four items. Subjects were asked to rate how frequently each statement had occurred during the past month. A five point Likert scale was used to rate each item, with 1 being "never" and five being "repeatedly." Each process represented by four items was summed and averaged. The average for each process-type was then summed and averaged to arrive at a total Behavioral processes score and a separate score for Cognitive processes.

The MANOVA main effect for stage of adoption has been found to be significant, Wilk's Lambda=.426, approximate F(40,3960)=24.98, p<.001. Follow-up univariate analysis of variance conducted on each of the ten processes of change have all been found to be significant (ps<.001). The effects of stage of adoption have been found to be generally large, with proportions of variance accounted for ranging from .06 to .45 (median=.18) (Marcus, Rossi, et al., 1992). See Table 2 on p.27 for the alpha coefficients for the ten processes of change indices when applied to two separate samples.

Decision-Making For Physical Activity or Exercise

A 16-item decisional balance measure previously developed for exercise (Marcus, Rakowski, et al., 1992) was administered (see Appendix E). This measure was composed of a ten-item "pro" scale which measured the benefits of exercising and a six-item "con" scale which measured the costs of exercising. Additionally, a decisional balance index was calculated by subtracting the sum of the con scale from the sum of the pro scale. Subjects were asked to rate each statement in terms of how important it was in their decision whether or not to exercise. A five point Likert scale was used to rate each item, with 1 being "not at all important" and 5 being "extremely important." Higher scores on the pro scale indicated perceptions of high benefits from exercise. High scores on the con scale indicated high costs of exercise.

Coefficient alpha (internal consistency) reliabilities for this measure have been found to be satisfactory (Cons=.79 and Pros=.95) (Marcus, Rakowski, et al., 1992). Total scores on the pro scale have been found to differentiate subjects at different stages [F(4,1034)=36.04, p<.001]. Similar findings emerged for total scores on the con scale [F(4,1039)=35.86, p<.001] and the overall decisional-balance index [F(4,1034)=61.59, p<.001] (Marcus & Owen, 1992).

Confidence for Physical Activity and Exercise

A five-item self-efficacy measure previously developed (Marcus, Selby, et al., 1992) to measure confidence in one's ability to persist with exercising in various situations was employed to measure physical activity or exercise confidence in this study (see Appendix F). Items within this measure represented the following areas: negative affect, resisting relapse, and making time for exercise. These areas have been shown to be important by other exercise researchers (Sallis, Pinski, Patterson, & Nader, 1988) as meaningful exercise self-efficacy factors. Subjects were asked to indicate how confident they were that they could exercise in five different situations. A five-point semantic scale was used to rate each item, with 1 indicating "not at all confident" and 5 " extremely confident." Higher scores on each item indicated greater self-efficacy for exercise.

Total scores on these self-efficacy items have been found to differentiate subjects at different stages [F(3,861)=85.93, p,.001]. Proportion of variance accounted for was .23. Test-retest reliability for this self-efficacy scale over a two-week period was reported as .90 (n=20) (Marcus, Selby, et al., 1992). Internal consistency for this measure has been found to be .84 (Marcus, Pinto, et al., 1994).

Self Report Measure of Physical Activity and Exercise

Exercise behavior was assessed by participants' self report of the frequency of their exercise behavior according to a procedure proposed by Godin, Jobin, & Bouillon (1986). Specifically, subjects were asked to indicate how many times they had exercised on average over the last four months. The response alternatives were as follows: none, less than once a month, about once a month, about 2 or 3 times a month, about 1 or 2 times a week, 3 times or more a week (see Appendix G). This measure has been found to have test-retest reliability and predictive validity.

As well, the self-administered 7-Day Physical Activity Recall (PAR) questionnaire was used. The self-administered PAR questionnaire has been validated and used in a health promotion study involving 117 school teachers (Blair, Collingwood, Reynolds, Smith, Hagan, & Sterling, 1984). Significant differences were found between experimental and control conditions as measured by the PAR questionnaire, and this effect was supported by direct measures of physical fitness (i.e., treadmill exercise test), body fat, and weight.

The following variables from the self-administered PAR questionnaire were assessed: a) vigorous physical activity (jogging, running, swimming), and b) moderate physical activity (golf, doubles tennis, yard work, brisk walking). Both types of activities were measured in terms of total number of minutes of participation for the past seven days. In addition, subjects were asked to list the types of activities they engaged in during the past week, and the number of hours of sleep in the past evening (see Appendix G).

Intention of Exercise Behavior

Behavioral intentions were assessed by a modification of Godin, et al.'s (1986) Exercise Behavior Questionnaire. This measure was employed by Rodgers and Gauvin (1995) in their examination of whether or not persons exercising two versus three times per week with intentions to maintain current level of activity form a homogenous group in terms of motivational features. Subjects were asked to indicate their intentions to participate in exercise and at what frequency over the next three months (see Appendix H).

Analyses

Frequency counts were used to determine the distribution of individuals on the stages of change measure. Coefficient alphas were calculated to determine the internal consistency of the self-efficacy, decisional-balance, and processes of change measures. In order to determine if the processes of change were used differentially by subjects in the various stages of change, a multivariate analysis of variance was conducted using stage of adoption as the independent variable and the 10 processes of change scales as the dependent variables. Analysis of variance was performed to assess the relationships between the stages of change measure and self-efficacy, decisional-balance, and self-reported physical activity behavior. Post hoc comparisons, such as the Tukey procedure, were used to determine which stages the measures were able to differentiate. Additionally, chi square analysis and other ANOVAs were used to assess the relationship between demographic variables and stage of adoption.

CHAPTER 4

RESULTS AND DISCUSSIONS

Response Rate

Of the 977 students approached and asked to participate in this study, 556 (56.9%) returned their informed consent forms and completed the Exercise Behavior Survey. Of these 556 completed surveys, 12 (2.2%) were unusable due to incomplete responses or missing values. The final sample size therefore, was 544, representing a useable return rate of 55.7%.

The return rate of 56.9% could be the result of a number of factors. A majority of these students who were asked to participate may not have been interested in the topic of physical activity and exercise and thus did not return their informed consent forms. As well, many of these students may have taken the informed consent forms and either lost them, forgot them in their lockers, or forgot them at home thus not returning the informed consent forms. The necessity of the Informed Consent forms did present a difficult obstacle to overcome in recruiting subjects. The difficulty resulted out of the requirement that both the students' signature and their parents' signature was needed on the consent form in order for the students to participate. The low return rate could very well be attributed to this requirement.

Demographic Profile of Participants

The students who participated in this survey ranged in age from 14 to 20 years of age, with the average age being 16.4 (SD=1.03). The majority of subjects in this study were female (n 'female'=309, 57% versus n 'male'=235, 43%).

Students who participated in this study represented all three secondary grades. Grade ten students comprised 43%(n=233) of the total sample, grade eleven students comprised 30% (n=163) of the total sample and grade twelve students comprised 27% (n=148) of the total sample. In terms of the courses surveyed, 33% (n=179) of the subjects were surveyed in P.E. 10, 24% (n=130) were surveyed in Career And Life Management (C.A.L.M.) 20, 18% (n=101) were surveyed in P.E. 30, 15%(n=81) were surveyed in P.E. 20, and 10% (n=52) were surveyed in other academic courses (Social Studies 30, Psychology 20, and Ukrainian 20/30). In regards to other activities outside of school or being a student, 37% (n=203) of the subjects surveyed were participating in some form of extracurricular activity such as an athletic team, a club not associated with the school, or music lessons. One fifth (n=109 or 20%) of the subjects surveyed were participating in an extracurricular activity and holding down a job of some sort, 15% (n=81) were not involved in other activities outside of being a student, 10% (n=55) had a part-time job only, 4% (n=18) volunteered on a regular basis, 3% (n=17) indicated they had a job but did not specify whether it was part or full time, and 1% (n=4) held down full time jobs.

Subjects were classified into one of the five stages, namely Precontemplation (n=31 or 6%), Contemplation (n=109 or 20%), Preparation (n=59 or 11%), Action (n=82 or 15%), and Maintenance (n=247 or 45%). The percentage of individuals classified in Precontemplation, Contemplation, and Maintenance stages of change for exercise in this study (Precontemplation=6%, Contemplation=20%, and Maintenance=45%) differs from the staging first reported by Marcus, Selby, et al. (1992) in which 24.4% of the subjects were classified into Precontemplation, 33.4% in Contemplation, and 22% classified into Maintenance. However, the distribution of subjects in Preparation and Action in this study was similar to that reported by Marcus, Selby, et al. (1992). In this study 11% of subjects were classified in Preparation and 15% were classified in Action compared to 9.5% classified in Preparation and 10.6% in Action by Marcus, Selby, et al. (1992). Therefore, the percentage of individuals classified in the inactive stages (Precontemplation and Contemplation) was greater in previous research (Marcus, Selby, et al., 1992) than in the present study, whereas the percentage of individuals who were regularly active (Maintenance) was greater in the present study. The percentage of individuals classified in the irregularly active stages (Preparation and Action) was similar in both studies.

The differences between these two studies in the distribution of subjects to stages may be attributed to one major factor. Adolescents in general are thought to be more active than adults. Estimates of youth participation in appropriate physical exercise range anywhere from 66% (Centers for Disease Control, 1985) to 52% (Williams, 1988) compared to such estimates as 20% (Stephens, Jacobs, & White, 1985) and 25% (Stephens, Craig, & Ferris, 1986) for adults. Therefore one would expect that a greater proportion of adolescents would be staged in the regularly active stage (Maintenance) than adults. Conversely, due to their lower participation rates, one would expect to find a greater proportion of adults staged in the inactive stages (Precontemplation and Contemplation) than adolescents. As well, participation in regular physical exercise generally decrease across the lifespan further supporting these staging differences.

The presence of a measurement artifact may also possibly explain for this difference between these two studies in the distribution of subjects across stages. Over half of the subjects in the present study were surveyed during physical education classes in physical activity settings (i.e., gymnasiums) and this may have affected the responses of these subjects. These circumstances may have caused an increase in the numbers of students staged in the upper stages of Maintenance and Action. This may be attributed to the active environment and mind set surrounding them while completing the questionnaire.

It is also important to note that subjects in the Marcus, Selby, et al. (1992) study also received a questionnaire that was accompanied by a cover letter requesting their participation from the company's chief executive officer. In return for their participation, all respondents were eligible for a $100 prize. Incentives such as these were not included within this study. Therefore less active individuals, who may not be as interested in the topic of physical activity and exercise, may have been less likely to agree to participate in this study. This may further explain the differences between these two studies in terms of the percentage of individuals staged within the inactive stages of Precontemplation and Contemplation.

Of the 544 useable subjects, only 16 (3%) were unable to be classified into one of the five stages. In comparison to the stage of change measure used by Marcus, Selby, et al. (1992) where 7% of the sample could not be classified, the revised measure used in this study appears to have performed better in terms of its ability to stage respondents.

Chi square analysis was used to determine if a relationship existed between the demographic characteristics and stage of change categories. Based upon this analysis no significant relationship was found between stage of change and grade (X^2=6.82, p=.56) and no significant relationship was found between stage of change and age (X^2=19.30, p=.74). As a result, one can conclude that stages of change and these variables were not significantly related.

Based upon Chi square analysis, a relationship was found to exist between stage of change and gender. Results of the Chi square analysis revealed that gender and stage of change were related (X^2=27.04, p<.0001). When examining Table 3, obvious relationships are evident. Males appear to be much more active on a regular basis than do females. Approximately 59 % (n=135) of males within this sample were staged in Maintenance compared to females, where only approximately 38% (n=112) were staged in Maintenance. As well, it appears that females tend to be much more irregularly active and non-active than do males. Analysis of variance also indicated that gender significantly differentiated the stages (F[4,473]=7.33, p<.0001). However, Goodman and Kruskal's lambda revealed that gender was not predictive of stages of change (p=.00000).

A relationship was also found to exist between stage of change and school class. Results of the Chi square analysis revealed that the null hypothesis that class and stage of change were independent could be rejected (X^2=53.49, p<.001). When examining Table 4 obvious relationships do appear. Those subjects in P.E. 20 and 30 are more active on a regular basis (Maintenance) than any other class. This is to be expected in that subjects within these classes are more apt to enjoy physical activity and exercise as expressed by their choice to take optional physical education courses. Goodman and Kruskal's lambda revealed that class however, was of no help in predicting stage of change (p=.008).

One last relationship was found to exist, that being between stage of change and other activities. Chi square analysis results revealed that the null hypothesis that other activities and stage of change were independent could be rejected (X^2=87.84, p<.0001). When examining Table 5, those who responded that they were involved in some sort of extracurricular activity, had a full time job, or had both a job and participated in extracurricular activities, tended to be more regularly active (Maintainers). Analysis of variance also indicated that the demographic variable 'other activities' significantly differentiated the stages (F[4,473]=9.59, p<.0001). Goodman and Kruskal's lambda revealed that other activities was not predictive of stage of change (p=.037).

Table 3
Chi Square Cross Tabulation: Stage of Change and Gender

	Males	Females	Row Total
Precontemplation	**14**	**17**	**31 or 5.9%**
Contemplation	**31**	**78**	**109 or 20.6%**
Preparation	**21**	**38**	**59 or 11.2%**
Action	**28**	**54**	**82 or 15.5%**
Maintenance	**135**	**112**	**247 or 46.8%**
Column Total	**229 43.4%**	**299 56.6%**	**528 100%**

Table 4
Chi Square Cross Tabulation: Stages of Change and Class

	P.E. 10	P.E 20	P.E. 30	CALM	Academics	Row Total
PR	**12**	**3**	**3**	**9**	**4**	**31 or 5.9%**
C	**36**	**10**	**17**	**29**	**17**	**109 or 20.6%**
P	**25**	**3**	**6**	**22**	**3**	**59 or 11.2%**
A	**27**	**12**	**11**	**25**	**7**	**82 or 15.5%**
M	**75**	**50**	**61**	**40**	**21**	**247 or 46.8%**
Column Total	**175 33.1%**	**78 14.8%**	**98 18.6%**	**125 23.7%**	**52 9.8%**	**528 100%**

Table 5
Chi Square Cross Tabulation: Stage of Change and Other Activities

	No	PT Job	FT Job	PT/FT Job	Activities	Activities & Job	Volunteer	Row Total
PR	**10**	**5**	**0**	**0**	**5**	**5**	**1**	**26** **5.4%**
C.	**25**	**22**	**1**	**5**	**24**	**17**	**5**	**100** **20.8%**
P	**8**	**7**	**1**	**4**	**17**	**9**	**2**	**49** **10.2%**
A	**8**	**6**	**0**	**2**	**32**	**23**	**1**	**73** **15.2%**
M	**23**	**12**	**2**	**6**	**121**	**55**	**13**	**232** **48.3%**
Column Total	**74** **15 %**	**52** **10%**	**4** **.8 %**	**17** **3.5%**	**199** **41.5%**	**109** **22.7%**	**22** **4.6%**	**480** **100%**

Processes of Change

The overall internal consistency of the processes of change measure used within this study was .94. Internal consistency reliabilities for the ten processes of change ranged from .56 to .85 (Social Liberation =.56, Stimulus Control =.67, Self Liberation =.68, Reinforcement Management =.70, Helping Relationships =.71, Environmental Reevaluation =.74, Counterconditioning =.77, Consciousness Raising=.80, Self Reevaluation =.80, and Dramatic Relief =.85). The effects of stage of adoption were generally small, with proportions of variance accounted for (n^2s) ranging from .0036 to .1947. Only one out of the ten effects exceeded Cohen's (1977) definition of a large effect size. For the behavioral processes index internal consistency was .82 and for the cognitive processes index internal consistency was .83.

In the Marcus, Rossi, et al.(1992) study, the processes of change internal consistencies ranged from .62 to .89. The Social Liberation process reported the lowest internal consistency at .62 and the Self Reevaluation process reported the highest internal consistency at .89 (see Table 2). In the present study, the Social Liberation process also reported the lowest internal consistency, but unlike Marcus, Rossi, et al. (1992) Dramatic Relief reported the highest internal consistency. Dramatic Relief however, was reported as having the second highest alpha level in the Marcus, Rossi, et al. (1992) study.

Overall, the internal consistencies reported in the present study for each of the ten processes of change are lower than those reported by Marcus, Rossi, et al. (1992). The reported differences between these two studies are quite small on some of the processes (i.e., Dramatic Relief, Social Liberation, Consciousness Raising, Stimulus Control) but much larger on other processes (i.e., Reinforcement Management, Helping Relationships). However, the lower reported alphas for each of the ten processes of change within this study when compared to the alphas reported by Marcus, Rossi, et al. (1992) may indicate that in the present study the items for each process may not fit together as well as they do within the adult sample.

These lower reported internal consistencies within the present study may partially be explained by the fact that within the present study there was a greater proportion of subjects who were regularly active compared to those who were irregularly or not active. Group homogeneity within this sample, in terms of regular activity, may have consequently resulted in low variance among these students resulting in lower reliability coefficients for each process. A more heterogeneous sample (more equal distribution of subjects across the stages similar to the distribution reported by Marcus, Rossi, et al., 1992) may have resulted in an increase in each processes' reliability.

These lower reported internal consistencies may also be a result of difficulties experienced by a proportion of these subjects in responding to this measure. During data collection the greatest number of questions from students when completing the questionnaire was in regards to the processes of change measure. A number of difficulties for students came in just trying to understand what the instructions of this measure was asking of them. As well, some of the questions were in regards to individual items (i.e., 'I have someone who points out my reasons for not exercising') in that they were unclear of what the item meant. Perhaps the difficulties experienced may have caused a restriction in score ranges and as result lower reliability coefficients for each process index.

The simple fact that adolescents are less independent than adults may have also contributed to these lower alpha coefficients. Adolescents do not have the same degree of control over things occurring in their lives as adults do. Some of these items may have been irrelevant or out of the control of these students and this may have caused responses for each of the process' four items to vary considerably. Thus, the process items did not correlate or hang well together. These lower alpha coefficients may simply be suggestive of the fact that adults and adolescents are different on the processes and strategies that are relevant to them or within their control.

To determine whether or not differences existed between each stage of change in the frequency of use for each of the ten processes of change, a multivariate analysis of variance and Tukey Tests were conducted for each of the ten processes of change. Table 6 presents each process of change mean, standard deviation, ANOVA and Tukey test results. Detailed ANOVA results may be found in Appendix I.

Table 6
Processes of Change Means, Standard Deviations, ANOVA and Tukey Test Results by Stage

▨	PC	C	P	A	M	F (Obs.)	Prob.
CR	**2.14_a** **(.99)**	**2.61_{ab}** **(.94)**	**2.77_{bc}** **(.94)**	**2.80_{bc}** **(.99)**	**3.02_c** **(1.07)**	**7.44**	**<.0001**
CC	**2.50_a** **(.93)**	**2.74_a** **(.82)**	**3.25_b** **(.86)**	**3.39_b** **(.85)**	**3.72_c** **(.77)**	**36.89**	**<.0001**
DR	**2.27_a** **(.76)**	**2.55_a** **(.91)**	**2.83_a** **(1.08)**	**2.54_a** **(1.03)**	**2.66_a** **(1.05)**	**1.90**	**.1088**
ER	**2.31_a** **(.99)**	**2.74_{ab}** **(.86)**	**2.86_{ab}** **(.87)**	**2.93_b** **(.98)**	**2.78_{ab}** **(.98)**	**2.56**	**<.0001**
HR	**2.05_a** **(.80)**	**2.19_a** **(.87)**	**2.19_a** **(.86)**	**2.72_b** **(.95)**	**2.59_b** **(.98)**	**7.75**	**<.0001**
RM	**2.51_a** **(.83)**	**2.76_{ab}** **(.84)**	**3.12_{bc}** **(.85)**	**3.18_c** **(1.00)**	**3.28_c** **(.88)**	**10.04**	**<.0001**
SL	**2.84_a** **(.79)**	**3.22_{ab}** **(.83)**	**3.51_{bc}** **(.75)**	**3.67_{cd}** **(.77)**	**3.89_d** **(.75)**	**23.44**	**<.0001**
SR	**3.01_a** **(1.22)**	**3.45_{ab}** **(1.00)**	**3.58_{ab}** **(1.04)**	**3.67_b** **(.96)**	**3.72_b** **(.98)**	**4.35**	**<.001**
SoL	**2.40_a** **(.97)**	**2.54_a** **(.77)**	**2.77_a** **(.86)**	**2.75_a** **(.85)**	**2.71_a** **(.90)**	**1.95**	**.1003**
SC	**2.03_a** **(.65)**	**2.05_a** **(.65)**	**2.17_a** **(.74)**	**2.34_{ab}** **(.79)**	**2.58_b** **(.88)**	**10.95**	**<.0001**

Note: Similar subscripts indicate the stages of change that were similar to one another in the frequency of use of the processes of change. Different subscripts indicate stages that were significantly different. CR=Consciousness Raising, CC=Counterconditioning, DR=Dramatic Relief, ER=Environmental Reevaluation, HR=Helping Relationships, RM=Reinforcement Management, SL=Self Liberation, SR=Self Reevaluation, Sol=Social Liberation, SC=Stimulus Control.

The MANOVA main effect for stage of adoption was significant, Wilk's lambda =.669, approximate F(4,256)=5.45, p<.0001. Follow-up univariate analysis of variance were conducted for each of the ten processes of change, and eight out of the ten processes were found to be statistically different (ps<.001). Further to this, the differences in use of each process of change, with the exception of social liberation and dramatic relief, are significantly greater than that which would be expected by chance alone.

The behavioral processes Counterconditioning, Helping Relationships, Stimulus Control, Self Liberation, and Reinforcement Management were found to be used differentially by subjects in different stages. In the present study, the process Counterconditioning was used significantly less by Precontemplators and Contemplators than Preparers, Actors, and Maintainers. Preparers and Actors used Counterconditioning significantly less than Maintainers. In the use of the process Helping Relationships, Precontemplators, Contemplators, and Preparers were found to use this process significantly less than Actors and Maintainers. In the use of Stimulus Control, Precontemplators, Contemplators, and Preparers used this process significantly less than those in Maintenance but not from those in Action. In the use of the process Reinforcement Management, Precontemplators were found significantly different than those in Preparation, Action, and Maintenance. Those in Precontemplation were found to use Reinforcement Management significantly less than those in Action and Maintenance. Finally, in the use of Self Liberation, Precontemplators were significantly different than subjects in Preparation, Action, and Maintenance. Contemplators used this process significantly less than those in Action and Maintenance and Preparers used this process significantly less than those in Maintenance.

With the experiential processes, subjects across the stages only used the processes Consciousness Raising, Environmental Reevaluation, and Self Reevaluation differentially. No two stages were significantly different in the frequency of use for the processes Social Liberation and Dramatic Relief. In the use of Consciousness Raising, Precontemplators used this process significantly less than those in Preparation, Action, and Maintenance. Contemplators used this process significantly less than those in Maintenance. In the use of Environmental Reevaluation, the only significant difference was found between Precontemplators and Maintenance. In the use of Self Reevaluation, Precontemplators used this process significantly less than those in Action and Maintenance.

Similar to the study conducted by Marcus, Rossi, et al. (1992), Precontemplators in this study were found to use the processes of change less often than subjects in the other four stages of change. Contemplators however, were not found to be significantly different from Precontemplators in the use of any of the processes of change which is also similar to that reported by Marcus, Rossi, et al. (1992).

Various patterns of use of the processes of change emerged across the stages for the behavioral and experiential processes. In the use of the behavioral processes, Counterconditioning was the only process for which Preparers were found to be significantly different from Contemplators. In the Marcus, Rossi, et al. (1992) study, Preparers were found to be significantly different from Contemplators in the use of Counterconditioning, Reinforcement Management, and Self-Liberation. In the present study, Preparers differed significantly from Actors in the use of Helping Relationships only which was not a finding in the Marcus, Rossi, et al. (1992) study.

Marcus, Rossi, et al. (1992) found the use of Counterconditioning and Reinforcement Management to increase from Action and into Maintenance, whereas use of the other behavioral processes, namely Helping Relationships, Self Liberation, and Stimulus Control tended to taper off in Maintenance. In the present study, use of the behavioral processes Counterconditioning, Reinforcement Management, Stimulus Control, and Self Liberation continued to increase from Action to Maintenance and use of Helping Relationships levelled off. These stages however, were not found to be significantly different from each other except in the use of Counterconditioning. Marcus, Rossi, et al. (1992) reported no significant differences between Action and Maintenance in the use of any of the five Behavioral processes.

In the use of the Experiential processes Precontemplators and Contemplators were not found to be significantly different on any of the processes. Precontemplators significantly differed from Preparers, Actors, and Maintainers in the use of Consciousness Raising, from Maintainers and Actors in the use of Self Reevaluation, and from Maintainers in the use of Environmental Reevaluation. Contemplators were found to significantly differ from Maintainers on Consciousness Raising. No significant differences were found between the stages in the use of Dramatic Relief and Social Liberation.

Use of the experiential processes Consciousness Raising, and Self Reevaluation reflected a pattern of increase in use from Precontemplation, to Contemplation, to Preparation, to Action, to Maintenance, but these differences were not significant. Use of the experiential processes Dramatic Relief and Social Liberation peaked in Preparation. Use of Environmental Reevaluation peaked in Action. Unlike the present study, Marcus, Rossi, et al. (1992) found Dramatic Relief, Environmental Reevaluation, Self Reevaluation, Social Liberation, and Consciousness Raising all to peak in the Action stage.

These differences may be attributable to the different nature of the subjects in this study. For example, adolescents may tend to judge or evaluate physical activity and exercise with respect to what it is 'worth' to them personally, therefore self reevaluation may be important to these individuals in maintaining regular participation in physical exercise. As well, through involvement in physical education classes and exposure to health promotion materials through C.A.L.M classes, students may be more informed of some of the health related aspects of participating in regular exercise. As a result consciousness raising may also be an important factor in maintaining their involvement in physical exercise. This combination of the personal value of exercise and a greater exposure to information about health benefits of exercise, may partially explain why the use of self reevaluation and consciousness raising continued to increase beyond Action into Maintenance.

These differences may also be attributable to the measure itself. This relates back to how relevant each item is to adolescents and their exercise behavior. It could be quite possible that due to the irrelevancy or possibly insignificance of many of these items to adolescents in their decision to exercise, the same stage differences did not occur for this sample as within the Marcus, Rossi, et al. (1992) study. Thus further refinement of this measure would be needed in order to determine more clearly why these differences do exist.

When examining Table 6, the mean for each process by stage also indicates the frequency of use of each process of change by individuals in each of the stages. Although there are some interesting points to note, one must be cautious when interpreting these points because statistical analyses were not conducted for them. However, by looking at the patterns of the ten scales across the stages, it is possible to see whether a low mean score was unique to one stage or similar across the stages indicating some type of measurement effect.

The two highest rated processes across Precontemplation, Contemplation, Preparation, Action, and Maintenance were Self Reevaluation (an experiential process, $\bar{x}$=3.01, 3.45, 3.58, 3.67, 3.72) and Self Liberation (a behavioral process, $\bar{x}$=2.84, 3.22, 3.51, 3.67, 3.89). The lowest rated process across Precontemplation, Contemplation, Preparation, Action, and Maintenance was Stimulus Control (a behavioral process, $\bar{x}$=2.03, 2.05, 2.17, 2.34, 2.58). Helping Relationships was also one of the lowest rated processes (a behavioral Process, $\bar{x}$=2.05, 2.19, 2.19, 2.59) in Precontemplation, Contemplation, Preparation, and Maintenance. In Action, Dramatic Relief (an experiential process, $\bar{x}$=2.54) was the other process reflecting the lowest ratings.

There appears to be some sort of measurement effect in play here, in that regardless of the stage of these subjects, the least used and most used processes were similar. The ten individual processes do not appear to differentiate these subjects as well as was the case within the Marcus, Rossi, et al. (1992) study. This possibly may be due to the nature of these subjects in comparison to the subjects used in the Marcus, Rossi, et al. (1992) study. Many of these items are possibly irrelevant to adolescents or not perceived as having a role in their own decision to exercise and therefore were the least used processes regardless of whether or not these subjects were inactive, irregularly active, or regularly active.

Adolescents in this study may not link personal activity with significant others or have anxious feelings when considering the health hazards of inactivity and hence the two processes Helping Relationships and Dramatic Relief may be irrelevant for them. This may explain why Helping Relationships and Dramatic Relief processes were rated the lowest. The opposite could be said for the highest rated processes. Adolescents in this study may reevaluate how they think about the outcomes of being inactive and recognize that they have the ability to choose whether or not to be active. So regardless of their stage of exercise behavior, adolescents in this study may have related most to the Self-Liberation and Self-Reevaluation processes. This may explain why Self-Liberation and Self-Reevaluation were the highest rated processes.

The processes that were used most frequently included items such as "I tell myself

I am able to exercise if I want to"(SL), "I tell myself that if I try hard enough I can keep exercising"(SL), "I am considering the idea that regular exercise would make me a healthier person to be around"(SR), and "I get frustrated with myself when I don't exercise"(SR). Self-statements such as these may have been either the easiest items to decipher, the items easiest to relate to, or in reality the processes of change used the most by these adolescents and as a result were the highest rated processes for these subjects.

When examining the total behavioral and experiential index mean scores (the five behavioral process scores are summed and averaged and the five experiential process scores are summed and averaged) (see Table 7), both indices were found to significantly differentiate the stages (F[4,523]=4.97, $p<.001$ for the total experiential index and F[4,523]=26.21, $p<.0001$ for the total behavioral index). Tukey's post hoc analysis revealed that for the total experiential index, Precontemplators had an experiential process score significantly less than those in Preparation, Action, and Maintenance. No other significant differences were found. On the total behavioral index, Precontemplators were found to have a behavioral process score significantly lower than those in Preparation, Action, and Maintenance, Contemplators' score on the behavioral processes were significantly lower than those in Action and Maintenance, and Preparers were found to have behavioral process scores significantly lower than those in Maintenance.

Table 7
Behavioral and Experiential Processes: Means and Standard Deviations by Stage

	Behavioral Processes		Experiential Processes	
Stage	$\bar{x}$	SD	$\bar{x}$	SD
PR	**2.39**	**.66**	**2.43**	**.74**
C	**2.60**	**.60**	**2.78**	**.67**
P	**2.85**	**.65**	**2.96**	**.75**
A	**3.06**	**.65**	**2.94**	**.75**
M	**3.22**	**.64**	**3.00**	**.80**

NOTE: Behavioral processes are the sum and average of Counterconditioning, Helping Relationships, Reinforcement Management, Self Liberation, and Stimulus Control. Experiential processes are the sum and average of Consciousness Raising, Dramatic Relief, Environmental Reevaluation, Self Reevaluation, and Social Liberation. 1=Never, 2=Seldom, 3=Occasionally, 4=Often, and 5=Repeatedly.

From this analysis of the total index scores, it is evident that Precontemplators and Contemplators do not differ in their use of either the behavioral or experiential processes. This finding replicates that which was found in the Marcus, Rossi, et al. (1992) study. The finding by Marcus, Rossi, et al. (1992) that the use of the behavioral processes of change tended to increase from Precontemplation to Action was also replicated by the present study. In both studies, use of the behavioral processes was also significantly greater in Preparation than in Contemplation. Marcus, Rossi, et al. (1992) also reported no significant differences in the use of behavioral processes between those in Action and those in Maintenance, a finding which was replicated within the present study.

These results do support a number of the hypothesis set out at the beginning of this study. Subjects did utilize ten processes of change. As well, Precontemplators used each of the ten processes of change substantially less than subjects in other stages indicating that those in Precontemplation do little to address their inactivity and its potential consequences. Further to this, Preparers and Contemplators were not hypothesized to differ in the use of the experiential processes, which was the case in this study. Precontemplators and Contemplators did not differ either on the use of behavioral processes.

The results of this study also partially support a number of hypotheses set out at the beginning of this study. It was thought that Preparers would tend to use the behavioral processes more often than Contemplators, which was the case but a significant difference was only found between these two stages with the use of the process Counterconditioning. As well, it was hypothesized that Actors would use both the experiential and behavioral processes more often than Preparers. The hypothesis that Actors would use the behavioral processes more than Preparers was partially supported in that Actors and Preparers were found to be significantly different in the use of both Helping Relationships and Reinforcement Management, however no significant differences were found between Actors and Preparers in the use of any experiential processes.

The last hypothesis that a decrease in the use of experiential processes, but not in the use of behavioral processes, would occur for Maintainers as compared to those in Action was also partially supported by the results in this study. However, there was not a decrease in use of the behavioral processes for individuals in Maintenance. The decrease in the use of the experiential processes occurred in Action rather than in Maintenance. This finding was also reported by Marcus, Rossi, et al. (1992). However, Marcus, Rossi, et al. (1992) found significance between Action and Maintenance in the use of Dramatic Relief, Environmental Reevaluation, and Self Reevaluation. Whereas no significant differences between these two stages were found in any of the experiential processes within this study.

Though the results of this study partially support those reported by Marcus, Rossi, et al. (1992), there are obvious discrepancies between the two studies to suggest that the process of change measure needs further adjustment and refinement before it can be efficaciously applied within an adolescent population. As the measure stands currently, the overall support from the results of this study for use of this measure within an adolescent sample is weak.

Though it may be conjectured that the weak support for the use of the processes of change measure to describe adolescent exercise behavior may just reflect the differences between adolescents and adults, there certainly are indications that there is a place for this measure to uncover the strategies and techniques adolescents use in their decision to exercise. The fact that eight out of the ten processes were found to be significant in the differential use by the stages suggests this. However making the items of this measure more relevant to the adolescent population being sampled might increase the internal consistency of each process and perhaps result in greater differentiation between the stages.

As the structure of this measure stands now, these processes are only effective in differentiating adolescents in Precontemplation from those in Maintenance. However, this is an acceptable beginning in that those adolescents who are inactive have been differentiated from those adolescents who are regularly active in terms of the processes they use. Further research on the refinement of this measure might improve the quality of information that could be uncovered using this measure.

Decisional Balance

The overall internal consistency of the decisional balance measure within this study was .77. Coefficient alpha reliabilities for the con scale and pro scale, respectively were .75

and .85. Using this same measure, Marcus, Rakowski, et al. (1992) reported similar reliability coefficients of .79 for the cons and .95 for the pros.

One-way analysis of variance was used to examine the association among stages of exercise adoption and the Pros and Cons indices. In addition, the relationship between the stages of exercise adoption and the Decisional Balance index (subtract Cons from Pros) was examined through a one-way analysis of variance. Table 8 presents the means and standard deviations for the con, pro, and decisional balance indices by stage.

Table 8
Pro, Con, and Decisional Balance Indices Mean Scores and Standard Deviations

	Stage of Adoption									
	PR		C		P		A		M	
Scale	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Pros	**3.24**	**.54**	**3.69**	**.73**	**3.81**	**.67**	**3.84**	**.70**	**3.83**	**.78**
Cons	**3.03**	**.73**	**2.70**	**.80**	**2.47**	**.72**	**2.49**	**.75**	**2.22**	**.77**
D.B.	**.22**	**1.06**	**.98**	**.99**	**1.33**	**.95**	**1.35**	**.94**	**1.60**	**1.06**

PR=Precontemplation, C=Contemplation, P=Preparation, A=Action, M=Maintenance, Pros= the average of all of the positively worded statements, Cons=the average of all of the negatively worded statements, and D.B.=the decisional balance of Pros minus the Cons. 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important, and 5=Extremely important.

Differences on the Pros scale by stage of adoption were significant, F(4,527)=4.84, p<.0001, n^2=.03. Tukey's post hoc analysis revealed that subjects within Precontemplation had significantly lower pro scores than those in Contemplation, Preparation, Action, and Maintenance. Pro scores increased from Precontemplation to Action but no other significant differences were found between stages. Marcus, Rakowski, et al. (1992) found Precontemplators and Contemplators to be significantly lower than those in Maintenance, Precontemplators, Contemplators, and Preparers were significantly lower than those in Action, and Precontemplators were significantly lower than those in Preparation and Contemplation. The present study replicated the finding of Marcus, Rakowski, et al. (1992) that those in Precontemplation are significantly lower on the pro scores than any other stage.

Differences on the Cons scale by stage of adoption were significant, $F(4,527)=13.13$, $p<.0001$, $n^2=.09$. Tukey's post hoc analysis revealed that Precontemplators were significantly higher on the con scores than those in Preparation, Action, and Maintenance. Contemplators and Actors were also found to have significantly higher con scores than those subjects in Maintenance. The con scores decreased from Precontemplation to Preparation but no other significant differences were found. Marcus, Rakowski, et al. (1992) found cons were significantly higher for Actors compared to Maintainers, Preparers compared to Action and Maintenance, Contemplation compared to Maintenance, and Precontemplation compared to all stages. The results of the present study replicated the findings that Actors had significantly higher con scales than those in Maintenance and Precontemplators had significantly higher con scores than those in Maintenance.

Lastly, the Decisional Balance analysis also achieved significance, $F(4,527)=16.85$, $p<.0001$, $n^2=.10$. Tukey's post hoc analysis revealed that Precontemplators were significantly different from Contemplation, Preparation, Action, and Maintenance with Precontemplators scoring lowest and Maintainers scoring highest. Contemplators were also significantly different from those in Maintenance. Decisional Balance scores increased from Precontemplation to Maintenance but no other significant differences were found. Marcus, Rakowski, et al. (1992) found that all stages were significantly different from all other stages, with Precontemplators scoring lowest and Maintainers scoring highest.

The results of this study support the hypothesis that subjects in Action and Maintenance have a decisional balance favouring the benefits of exercise and for persons in Preparation the costs and benefits of exercise are in balance. However the hypothesis that subjects in Precontemplation and Contemplation have a decisional balance favouring the costs of exercise was not supported by the results of this study. Precontemplators and Contemplators within this study did have the lowest decisional balance scores. However, for subjects in Precontemplation and Contemplation their pro scores were higher than their con scores and similar to those in Preparation, their costs and benefits of exercise were in balance.

In both the present study and the Marcus, Rakowski, et al. (1992) study, scores on the decisional balance scales were significantly related to stage. Precontemplators had relatively lower pro, higher con, and lower decisional balance scores, whereas those in Maintenance had relatively higher pro, lower con, and higher decisional balance scores. Though clear differentiation between all stages did not emerge within this study as was the case within the Marcus, Rakowski, et al. (1992) study, the results from the present study do serve to support the utility of this decisional balance measure. The decisional balance model emphasizes the importance of perceiving high benefits (pros) and low costs (cons) before behavior change can occur. The pattern of relationships found in the present data is consistent with this hypothesis. However, further development in this measure through a factor analysis of other items relevant to this population sample might result in higher internal consistencies and thus better differentiation between stages.

Self-Efficacy

The overall internal consistency of the five-item self-efficacy measure used within this study was .69. This is somewhat lower than the internal consistency of .76 reported by Marcus, Selby, et al. (1992) for this same self-efficacy measure. Once again, the homogeneity of subjects within this sample may partially explain for this difference in reported internal consistencies. Table 9 provides the means and standard deviations for all five stages.

Table 9
Self-Efficacy Index: Mean Scores and Standard Deviations

	Self-Efficacy	
Stage	$\bar{x}$	SD
Precontemplation	**2.25**	**.83**
Contemplation	**2.61**	**.69**
Preparation	**2.70**	**.59**
Action	**2.97**	**.72**
Maintenance	**3.41**	**.75**

Note: 1=Not at all confident, 2=Slightly confident, 3= Moderately confident, 4=Very confident, and 5=Extremely confident.

One-way analysis of variance was used to examine the relationship between the stages of change and self-efficacy. Differences on the self-efficacy index by stage was found to be significant, F(4,527)=38.56, $p<.0001$. Proportion of variance accounted for (n^2) was .21. Tukey's post hoc analysis revealed that Precontemplators had significantly lower self-efficacy scores than those in Preparation, Action, and Maintenance. Contemplators had significantly lower self-efficacy scores than those in Action and Maintenance, Preparers had significantly lower self-efficacy scores than those in Maintenance, and those in Action had significantly lower self-efficacy scores than those in Maintenance. Maintenance was found to be significantly different then all stages.

These results replicate the findings reported by Marcus, Selby, et al. (1992). The only difference between the present study and the previous study is that Precontemplators were found to be significantly different from Contemplators which was not the case in this study. However all of the differences between stages found in this study were reported by Marcus, Selby, et al. (1992). As well, both the current study and that reported by Marcus, Selby, et al. (1992) found Precontemplators to score the lowest and those in Maintenance to score the highest on this self-efficacy measure.

Self Report of Physical Activity and Exercise

Consistent with the model and previous literature (Marcus, Rossi, et al. 1992; Marcus & Simkin, 1993), self-reported levels of vigorous physical exercise significantly differentiated the stages (F[4,474]=33.62, $p<.0001$, $n^2=.22$). Post hoc analysis revealed that Precontemplators, Contemplators, and Preparers participated in significantly less self-reported vigorous physical exercise over a seven day period than those in Action and Maintenance. Precontemplators participated in self-reported vigorous activity the least and those in Maintenance participated in self-reported vigorous physical activity the most. Although the individuals in Maintenance reported a higher frequency of participation than those in Action, this was not a significant difference. Table 10 presents the mean frequency of reported hours in vigorous physical exercise for each stage and the standard deviations.

Table 10
Self-Reported Frequency of Vigorous Physical Exercise: Mean Frequency of Hours and Standard Deviations

	Self-Reported Frequency of Vigorous Physical Exercise	
Stage	$\bar{x}$	SD
Precontemplation	**1.50**	**1.85**
Contemplation	**1.89**	**2.54**
Preparation	**3.80**	**3.51**
Action	**6.51**	**6.77**
Maintenance	**8.14**	**5.74**

Note: The $\bar{x}$ scores are the average reported number of hours of vigorous physical activity over the previous seven days.

The 7-Day Physical Activity Recall Questionnaire (PAR-Q) as a whole (score based on frequency of vigorous physical exercise, moderate physical exercise, and hours of sleep the previous night) also significantly differentiated the stages (F[4,474]=13.46, $p<.0001$, $n^2=.10$). Precontemplators had a significantly lower PAR-Q score than those in Maintenance, Contemplators had a significantly lower PAR-Q score than those in Action and Maintenance, and those in Preparation were significantly lower on the PAR-Q than those in Maintenance. Scores on the PAR-Q increased from Precontemplation to Maintenance and Maintainers had a higher mean PAR-Q score than those in Action though this difference was not significant. Table 11 presents the mean PAR-Q scores for each stage and the standard deviations.

Table 11
7 Day Physical Activity Recall: Mean Scores and Standard Deviations

	Mean PAR-Q Scores	
Stage	$\bar{x}$	SD
Precontemplation	**51.23**	**20.83**
Contemplation	**51.33**	**19.26**

Preparation	**66.55**	**57.60**
Action	**77.27**	**47.94**
Maintenance	**83.79**	**40.93**

Note: Refer to Appendix G for calculation of PAR-Q score.

The Godin, Jobin, & Bouillon (1986) item asked subjects to indicate how often they had exercised on average over the last four months. Scores on this item also achieved significance (F[4,474]=51.71, p<.0001, n^2=.30). Post hoc analysis indicated that Precontemplators and Contemplators had exercised significantly less over the past four months than Preparers, Actors, and Maintainers and both Preparers and Actors had exercised significantly less than Maintainers over the past four months. An increase in the number of times exercising in the last four months increases from Precontemplation to Maintenance but no other significant differences were found. Table 12 presents the average scores and deviations for each of the stages.

Table 12

Average Frequency of Exercise Over Past Four Months: Means and Standard Deviations

	Average Frequency of Exercise Over Past Four Months	
Stage	$\bar{x}$	SD
Precontemplation	**3.13**	**1.59**
Contemplation	**3.49**	**1.05**
Preparation	**4.12**	**.99**
Action	**4.22**	**.80**
Maintenance	**4.75**	**.68**

*Note: 0=None, 1=Less than once a month, 2=About once a month, 3=About 2 or 3 times a month, 4=About 2 or 3 times a week, 5=3 times or more a week.

These measures support the construct validity of the stages of change model and its application within an adolescent population. Marcus and Simkin (1993) reported that one's reported stage of change was consistent with self-reported physical activity on the 7-Day Physical Activity Recall Questionnaire which was replicated and supported by the results of this study. Scores for subjects within this study on these behavior items significantly differentiated them among the stages demonstrating that the stage instrument has concurrent validity with a well accepted activity instrument when applied within an adolescent sample.

Intention of Exercise Behavior

The item which asked subjects if they intended to engage in physical activity over the next three months (yes/no) and at what frequency provided an interesting finding. Marcus and colleagues' stage item does incorporate intention to exercise, however, they have not examined this type of item. Marcus and colleagues' have not directly asked their subjects if they have the intention to exercise but have combined intention with the behavioral criterion within the stages of change operationalizations.

The item employed by Rodgers and Gauvin (1995) was examined in this study because of the importance 'intention to exercise' plays in the acquisition and maintenance of physical exercise behavior and to incorporate multiple measures of this construct. As well, it was thought that this type of item might provide additional information on the determinants of exercise behavior in adolescents.

The question 'Do you intend to engage in physical activity over the next 3 months?' was not found to significantly differentiate subjects by stage. Of the total sample 88.4% (n=418) replied 'Yes' to this item while only 2.6% (n=14) replied 'No" to this item. The remaining 9% was missing data.

Regardless of stage, it appears that the majority of adolescents within this sample have the intention to exercise. However, at what frequency subjects intended to exercise was found to significantly differentiate the stages (F[4,525]=12.24, p<.0001). Subjects in Precontemplation intended to exercise significantly less than those subjects in Action and Maintenance and Contemplators and Preparers intended to exercise significantly less than those in Maintenance. Frequency of intention to exercise over the next three months was found to increase from Contemplation to Maintenance but no other significant differences were found. Table 13 presents the mean frequency and standard deviations for intention to exercise over the next three months.

Table 13

Intention to Exercise Over the Next Three Months: Mean Scores and Standard Deviations

	Frequency of Intention to Exercise	
Stage	$\bar{x}$	SD
Precontemplation	**3.74**	**1.32**
Contemplation	**4.14**	**1.14**
Preparation	**4.14**	**1.48**
Action	**4.54**	**1.07**
Maintenance	**4.72**	**.71**

*NOTE: 0=None, 1=Less than once a month, 2=About once a month, 3=About 2 or 3 times a month, 4=About 2 or 3 times a week, 5=3 or more times a week.

These results suggests that for this group of adolescents, it is not simply the intention to exercise that differentiates those that are regularly active from those who are irregularly active or inactive. What differentiates these individuals is the frequency element of intention to exercise. How many times these adolescents perceive themselves exercising over the next three months appears to be more indicative of their current activity level, more so than whether or not they intend to exercise over the next three months. This is in contradiction to what Marcus and colleagues have found. Their findings, based on their staging conceptualizations, show that Precontemplators do not have the intention to exercise. This has not been supported within this study.

CHAPTER 5
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary and Conclusions

It is now common knowledge that regular participation in physical activity and exercise is a key component in the maintenance of good health. Unfortunately, children are not sufficiently active to produce desired health benefits. The process of attempting to increase or change these physical activity and exercise habits is complex.

It has been suggested that this complexity in affecting positive behavior change may be better understood by viewing the physical activity engagement process as a sequence of stages through which different processes are applied over time (Knapp, 1988; Marcus, Banspach, et al., 1992). The Transtheoretical Model of Behavior Change, proposed by Prochaska and DiClemente (1982), is one such stage-based model of change that has recently been applied to the initiation and maintenance of physical activity and exercise.

A limitation in the research of the Transtheoretical Model within the exercise domain however, has been the sole use of adult subjects. This investigation attempted to determine the utility of the Transtheoretical Model for understanding physical activity engagement and maintenance within an adolescent population.

The independent variables of processes of change, self-efficacy for exercise, decision-making for exercise, self-reported physical activity, and demographic characteristics were examined for their differential use and explanatory value for the dependent variable of adolescent exercise stage of change. Previously designed and validated instruments developed by Marcus and colleagues were used to measure the independent variables. Essentially this study attempted to replicate the work of Marcus and colleagues, except this study employed a different population.

For data collection, high school subjects were contacted on two separate occasions. On the first occasion, potential subjects were informed of the intentions of the project and informed consent forms were distributed. On the second occasion, informed consent forms were collected and the questionnaire administered to those who provided informed written and parental consent. The questionnaire on exercise and basic demographic information was completed during scheduled class times. Incentives for participation were not employed within this study. Of the 977 students approached and asked to participate in this study, 544 completed the Exercise Behavior Survey.

Subjects in this study were high school students from eight urban high schools. These students ranged in age from 14 to 20 years of age, were enrolled in a number of different classes, and represented all three secondary grades. Subjects (of which the majority were female) were classified into one of five stages, namely Precontemplation, Contemplation, Preparation, Action, and Maintenance. Approximately one quarter of these subjects were staged as not exercising, another quarter of these subjects were staged as exercising on an irregular basis, and just under half of these subjects were staged as regularly exercising. The proportion of individuals classified in the inactive stages was greater in previous research (Marcus, Selby, et al., 1992) than in the present study, whereas the proportion of individuals who were regularly active was greater in the present study. The proportion of individuals classified in the irregularly active stages was consistent across both studies.

The discrepancies between this study and previous research in the distribution of subjects to stages may be attributed to three major factors. First, adolescents in general are thought to be more active than adults. Second, a measurement artifact may have been present in that over half of the subjects in the current study were surveyed during physical education classes in physical activity settings (i.e., gymnasiums) and this may have affected the responses of these subjects. Thirdly, incentives to participate were not included within this study unlike in the Marcus, Selby, et al. (1992) study. As a result, less active individuals who may not be as interested in the topic of physical activity, may have been less likely to participate in this study.

Stage of change was not found to be associated with the demographic variables of age or grade. Stage of change was however, found to be related to the demographic variables of school class, gender, and other activities. Males, subjects surveyed in optional physical education classes, subjects involved in extracurricular activities, and subjects holding down part time or full time jobs tended to be more regularly active.

The overall processes of change measure was found to have satisfactory reliability. However, individual process reliabilities were lower when applied in the adolescent sample compared to the reliabilities reported for each process when applied in adult samples. Adolescents did however, utilize the ten processes of change. Eight of the ten processes of change (CR, CC, ER, HR, RM, SL, SR, and SC) were found to differ in the frequency of use depending upon the stage of change of the respondents.

Precontemplators in this study used the processes Reinforcement Management, Self Liberation, and Consciousness Raising less frequently than those subjects in Preparation, Action, and Maintenance. This suggests that for those subjects who were inactive provided themselves with fewer rewards for being active, failed to recognize that they have the ability to choose whether or not to be active, and did not increase their own awareness and personal information regarding the outcomes of sedentary behavior to the same extent as those who were irregularly and regularly active.

Precontemplators also used Self Reevaluation less frequently than those subjects in Action and Maintenance suggesting that the difference between inactive and active subjects is also the degree to which these individuals reevaluate how they think and feel about the outcomes of a sedentary lifestyle. Inactive subjects may not perceive the outcomes of a sedentary lifestyle as being as detrimental as do those subjects who are active. Precontemplators were also found to differ from Maintainers in their frequency of use of the Environmental Reevaluation process. Inactive subjects in this study appeared to consider and assess how their inactivity affects the environment around them far less than those who were regularly active.

Precontemplators and Contemplators used the process Counterconditioning less often than Preparers, Actors, and Maintainers suggesting that those subjects who are inactive do not substitute alternative behaviors for remaining inactive to the degree that active subjects do. Subjects who are inactive do little in terms of changing the way they think or feel about their inactivity and about being active, than those who are irregularly and regularly active. As well, Preparers and Actors used the process Counterconditioning less frequently than those in Maintenance suggesting further that the difference between being irregularly active and becoming regularly active involves changing the way one thinks and feels about inactivity and activity.

In the use of Helping Relationships, Precontemplators, Contemplators, and Preparers were found to use this process less than those subjects in Action and Maintenance which suggests that those subjects who are active trust, accept, and utilize the support of others in their decision to exercise more so than those subjects who are inactive and preparing to become active. Precontemplators, Contemplators, and Preparers also used Stimulus Control less frequently than those subjects in Maintenance. This suggests that those subjects who were inactive or still contemplating and preparing to become regularly active, exerted less control over situations and other causes that may trigger inactivity.

Contemplators, who were considering the idea of becoming active, were found to use the process Self Liberation less frequently than those subjects in Action and Maintenance. This suggests that the difference between those subjects who are thinking about becoming active and those subjects who are active, lies once again in the individual's choice and commitment to change the problem behavior, including the belief that they can change. Active subjects in this study appear to have chosen and made the commitment to become active more so than those subjects who intend to become active but have not yet done so.

Contemplators were also found to differ from Maintainers in the frequency of use of the process Consciousness Raising. Efforts by an individual to seek new information and to gain understanding and feedback about remaining sedentary was shown to occur less frequently with those individuals who were contemplating becoming active than with those who were already active.

These results suggest that in the attempt to achieve maintenance of regular physical activity for adolescents, receiving reinforcement, changing the way one thinks about and responds to a sedentary lifestyle, believing that one has the ability to be physically active, being committed to participation in physical activity, and controlling situations that may trigger inactivity are all especially important. As well, utilizing caring others in attempts to become more active, considering how inactivity affects physical and social environments, and increasing one's own awareness regarding sedentary behavior, are important in the maintenance of adolescents' regular participation in physical activity.

The results of this processes of change analysis did partially support those reported by Marcus, Rossi, et al. (1992). These ten individual processes however, did not appear to differentiate these subjects as well as within the Marcus, Rossi, et al. (1992) study and the discrepancies between these two studies does suggest that the process of change measure needs further adjustment and refinement in order to be efficaciously applied within an adolescent population.

Refinement of this measure by perhaps making the items within this measure more relevant to adolescents might improve the sensitivity by which these processes differentiate the intermediate stages and increase the quantity and quality of information that could be uncovered regarding adolescent exercise behavior. However, it may also be that adolescents and adults are actually different on the processes of change they use in their attempts to exercise. Future research is needed in order to determine further the utility of this processes of change measure and its application to adolescent exercise behavior.

The overall internal consistency of the decisional balance measure (weighing of the pros and cons) within this study was found to be satisfactory and consistent with that reported by Marcus, Rakowski, et al. (1992).

The results of the decisional balance analysis suggest that subjects who were inactive (Precontemplation) placed a greater emphasis on the negative aspects of exercise than subjects in the other stages as exhibited by their higher con scores. Those subjects who were regularly active (Maintenance) on the other hand, placed a greater emphasis on the positive aspects of exercise participation than subjects in the other stages as exhibited by their higher pro scores. Adolescents in this study with the higher perceptions that exercise would make them feel healthier and better were positively related to greater readiness for exercise. Conversely, adolescents with the higher perception that they would feel sore and have little time for exercise were negatively associated with readiness for exercise. This result is similar to those reported by Marcus, Rakowski, et al. (1992).

It would be inaccurate however, to suggest that inactive subjects in this study perceived the benefits of exercise to be outweighed by the consequences of exercise because those subjects who were inactive had slightly higher pro scores than their own con scores. This somewhat positive balance between the pros and cons may possibly be the result of these subjects' greater exposure to information regarding physical activity and exercise and the benefits of regular participation. The present data however, do not allow for interpretation of this finding. It should be regarded as a potential weakness of the cost benefits analysis, or, possibly an adolescent-adult distinction.

Inactive subjects did however, have pro scores that were significantly lower than subjects in all other stages and had con scores significantly higher than those subjects in Preparation, Action, and Maintenance (irregularly and regularly active). This suggests that these adolescents who were inactive had a higher perception of the cons of exercise and a lower perception of the benefits (pros) of exercise when compared to active subjects. As a result, subjects with these perceptions were negatively associated with participation in activity. This was not a finding of Marcus, Rakowski, et al. (1992).

Though clear differentiation between all stages, on the basis of decisional balance, did not emerge within this study as was the case within the Marcus, Rakowski, et al. (1992) study, the results from the present study do serve to support the utility of this decisional balance measure and Janis and Mann's (1968, 1977) decisional balance model. The decisional balance results from this study provide further evidence that individuals in different stages place differential importance on both the positive and negative aspects of exercise participation. However, further development of this measure by making the items more relevant to this population might result in increased differentiation between stages, and thus, greater quantity and quality of information that could be uncovered regarding adolescent exercise behavior.

The overall internal consistency of the five-item self-efficacy measure used within this study was also found to be satisfactory but was somewhat lower than the internal consistency reported by Marcus, Selby, Niaura, and Rossi (1992). Group homogeneity within this sample, in terms of readiness to change, may have accounted for this difference. Marcus, Selby, et al. (1992) had a more even distribution of subjects across the stages within their sample. Whereas within this study where testing and participant recruitment was limited to classrooms made available to the researcher by each school, a large proportion of this adolescent sample (45%) were staged in Maintenance.

Adolescents in this sample who expressed a high level of confidence to engage in physical activity, even when they may have been tired, in a bad mood, or had little time can be seen as having high self-efficacy for exercise. These adolescents can be expected to have felt much more readiness for exercise, and engaged in greater amounts of physical activity, than individuals with low self-efficacy. This is consistent with Bandura's (1977a, 1977b) theory which hypothesizes that an individual's level of confidence is significantly related to actual behavior. The self-efficacy results from this study showed a steady and significant increase from Precontemplation to Maintenance in self-reported confidence to exercise. That is, self-efficacy for exercise increased as individuals increased in the amount of exercise they participated in. This result is consistent with that reported by Marcus, Selby, et al. (1992) and further supports the importance of self-efficacy as a determinant of adolescent physical activity behavior reported by Reynold's et al. (1990) .

In terms of self-reported physical activity participation, subjects in the different stages reported different levels of "vigorous exercise" over the previous seven days, different frequencies of exercise participation over the last four months, and generated different PAR-Q scores. Scores on 'vigorous hours', the 'PAR-Q', and 'over the last four months' increased from Precontemplation to Maintenance, with Maintainers having the highest mean scores and those in Precontemplation having the lowest mean scores. These results replicated those reported by Marcus and Simkin (1993) in that the stage of change classifications were consistent with self-reported physical activity. The concurrent validity that the stage instrument has with these activity behavior instruments further suggests the utility of this model in its application to adolescent physical activity behavior.

Though these results support the construct validity of the stages of change model and its application within an adolescent sample, it is important to note that the frequency of self-reported physical exercise on the 'last four months' item contradicts the initial definitions of some of the stages of change. Precontemplation was defined as 'currently not exercising and not intending to exercise', yet Precontemplators in this sample reported an average frequency of 3.13 (about 2 or 3 times a month) over the past four months. As well, Contemplation was defined as 'currently do not exercise but am thinking about starting to exercise', yet Contemplators in this study reported an average frequency of 3.49 (about 2 or 3 times a month) over the past four months. These discrepancies may simply be the result of the greater self-interpretation possible in this item when compared to the more precise stage definitions of Marcus and Simkin (1993). However a deeper issue is important to address here.

This type of item differs from Marcus and colleagues' staging item, in that this item is less specific and more open to individual interpretation as to how to define regular physical exercise participation. Whereas, Marcus and colleagues use the ACSM (American College of Sports Medicine, 1990) guidelines which defines regular physical exercise participation as three or more exercise bouts per week for at least 20 minutes each time. Such contradictions between the staging definitions and the self-reported physical activity over the last four months within this study suggests a problem issue between operationalization versus conceptualization.

Marcus and colleagues' stringent use of the ACSM guidelines in their definition of stages as the behavioural criterion may be inappropriate and may result in many individuals who may be exercising regularly on an "active living" premise (i.e., walking, gardening, painting, etc.), to be staged in Precontemplation. Whereas if the behavioural criterion were based on a more general definition or a definition left up to self-interpretation (such as within the 'last four months' item), individuals would be staged and grouped quite differently, which the results of this study appear to indicate.

These contradictions do indicate a problem between how 'regularly active' and 'irregularly active' individuals are conceptualized and how these conceptualizations are operationalized (stage or grouped) within studies such as these. Though this issue is beyond the scope of this study, it may be suggested that further research in this area is needed to develop similar and consistent conceptualizations of the behavioural criterion across different points in the lifespan. In other words, what constitutes a 'regularly physically active person' and what might the indications of this be in regards to stage? Gorley and Gordon (1995) ffered this same recommendation that consideration be given to the use of the ACSM definition of exercise within their study on the application of the Transtheoretical Model to the exercise behavior of older adults.

The simple intention to exercise on the other hand, was not found to differentiate the stages. Regardless of stage, the majority of adolescents within this sample expressed the intention to exercise. The environment that a large number of these subjects were surveyed in and the environment that these subjects are continually exposed to (i.e., intramurals, sport clubs, and health classes) that encourages activity may partially explain why the majority of these subjects had the intention to exercise.

At what frequency however subjects intended to exercise, was found to be significantly different across the stages. Subjects in Precontemplation intended to exercise significantly less than those subjects in Action and Maintenance and Contemplators and Preparers intended to exercise significantly less than those in Maintenance. Frequency of intention to exercise over the next three months was found to increase from Contemplation to Maintenance but no other significant differences were found.

From the results of this study it does not appear that the intention to exercise differentiates those that are regularly active from those who are irregularly active or inactive. What differentiates these individuals is the frequency of intention to exercise. How many times these adolescents perceive themselves exercising over the next three months appears to be more indicative of their current activity level, more so than whether or not they simply intend to exercise over the next three months. This is in contradiction to what Marcus and colleagues have found. Their definition of Precontemplation, based on their staging conceptualizations, suggest that Precontemplators do not have the intention to exercise. This has not been supported within this study.

This discrepancy, again suggests an enigma or problem issue with the stage of change operationalizations. It may possibly be that adolescents are different from adults in that all adolescents may have the intention to exercise. Adults may also be more realistic, having not exercised for extended periods of time and no longer project the intention. However, it could also possibly be a measurement issue in that Precontemplators regardless of age have intention to exercise and that frequency of intention is the differentiating factor. This would require a revision of how the stages are defined. Further research in this area is necessary to determine more clearly whether or not intention to exercise differentiates stage of change or if frequency of intention is what differentiates the stages. Once this has been established, consistent conceptualizations of the intentional criterion across different points in the lifespan may be developed.

Although there was not strong discrimination between all of the stages of readiness to exercise and the processes of change and decisional balance measures, there were strong differences between the Precontemplators and those at other stages. As well, there was strong discrimination between the stages of readiness to exercise and the self-efficacy and self-report of physical activity measures. These results and the similarity of some of these results to previous literature provides partial support for use of the Transtheoretical Model to the exercise behavior of adolescents. Though the cross-sectional design limits statements on causal relationships and the self-selected nature of this sample limits generalizability of results, this study does represent the application of the Transtheoretical Model to understanding exercise behavior in adolescents. Based on the results of this study however, several recommendations may be made.

Recommendations

Based upon the results of this study, the following recommendations can be made in regards to future research:

1). In order to recruit a more heterogeneous sample, future research with the application of the stages of change model to adolescent physical activity behavior should try to avoid collecting data within physical education courses. By surveying in physical education classes, this sample may have ended up being more homogeneous than would have been liked. Further research in this area might also want to attempt to survey adolescents outside of the school environment and consider employing incentives for participation.

2). Future research should attempt to further develop and refine the process of change measure in order for it to be efficaciously applied within an adolescent population.

Perhaps through focus groups, individual interviews, or questionnaire surveys with adolescents, more relevant and sensitive process items may be identified.

3). Future research should also attempt further development of the decisional balance measure by increasing the relevancy of these items to this population. This might result in increased differentiation between stages, and thus, greater quantity and quality of information that could be uncovered regarding adolescent exercise behavior and their decision to exercise.

4). More study is needed in the area of the behavioural and intentional criterions for the stage of change conceptualizations and operationalizations. Further research in this area is necessary develop clear and consistent conceptualizations of the behavioral and intentional criterion across the different stages across different points in the lifespan.

5). This study partially demonstrated the Transtheoretical Model's use in understanding adolescents' involvement in physical activity. Replication studies using more diverse and heterogeneous samples of adolescents are needed.

REFERENCES

American College of Sports Medicine. (1990). Position statement on the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults. Medicine and Science in Sports and Exercise, 22, 265-274.

Anderssen, N., & Wold, B. (1992). Parental and peer influences on leisure-time physical activity in young adolescents. Research Quarterly for Exercise and Sport, 63, 341-348.

Armstrong, C.A., Sallis, J.F., Hovell, M.F., & Hofstetter, C.R. (1993). Stages of change, self-efficacy, and the adoption of vigorous exercise: A perspective analysis. Journal of Sport and Exercise Psychology, 15, 390-402.

Ajzen, I. (1985). From intention to actions: A theory of planned behavior. In Kuhl & Beckmann (Eds.), Action-control: From cognition to behavior, pp.11-39. Heidelburg:Springer.

Ajzen, I., & Madden, T.J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. Journal of Experimental Social Psychology, 22, 453-474.

Bandura, A. (1977a). Social learning theory. Englewood Cliffs, CA:PrenticeHall.

Bandura, A. (1977b). Self-efficacy: Toward a unifying theory of behavioral change. Psychology Review, 84, 191-215.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ:Prentice Hall.

Becker, M.H., Haefner, D.P., Kasl, S.V., Kirscht, J.P., & Maiman, L.A. (1977). Selected psychosocial models and correlates of individual health related behaviors. Medical Care, 15, 27-46.

Belisle, M., Rosies, E., & Levesque, J.M. (1987). Improving adherence to physical activity. Health Psychology, 6, 159-172.

Berenson, G.S., MacMahon, C.A., & Voors, A.W. (1980). Cardiovascular risk factors in children: The early natural history of atherosclerosis and essential hypertension. New York, NY:Oxford University Press.

Blair, S.N., Collingwood, T.R., Reynolds, R., Smith, m., Hagan, D., & Sterling, C.L.

(1984). Health promotion for educators: Impact on health behaviors, satisfaction, and general well-being. *American Journal of Public Health, 74*, 147-149.

Blair, S.N., Kohl, H.W., Paffenberger, R.S., Clark, D.G., Cooper, K.H., & Gibbons, L.W. (1989). Physical fitness and all-cause mortality. *Journal of the American Medical Association, 262*, 2395-2401.

Blair, S.N., Powell, K.E., & Bazarre, T.L. (1993). Physical inactivity. *Circulation, 88*, 1402-1405.

Brawley, L.R., & Rodgers, W.M. (1993). Social-psychological aspects of fitness promotion. In P. Seraganian (Ed.), *The influence of physical exercise on psychological processes*, (pp.254-296).

Butcher, J. (1983). Socialization of adolescent girls into physical activity. *Adolescence, 18*, 753-766.

CAHPER. (1992 - 1993). *Physical education 2000.* Gloucester, ON:CAHPER.

Centers for Disease Control. (1985). Status of the 1990 physical fitness and exercise objectives. *Morbidity and Mortality Weekly Report, 34*(34), 521-524.

Cohen, J. (1977). *Statistical power analysis for the behavioural sciences (rev. ed.)*. New York, NY: Academic Press.

Cresanta, J.L., Burke, G.L., Downey, A.M., Freedman, D.S., & Berenson, G.S. (1986). Prevention of atherosclerosis in childhood: Prevention in primary care. *Pediatric Clinical Journal of North America, 33*, 835-858.

Daltroy, L.H., & Godin, G. (1989). Spouse intention to encourage cardiac patient participation in exercise. *American Journal of Health Promotion, 4*, 12-17.

DiClemente, C.C., Prochaska, J.O., & Gibertini, M. (1985). Self-efficacy and the stages of self-change of smoking. *Cognitive Theory and Research, 9*, 181-200.

DiClemente, C.C., Prochaska, J.O., Velicer, W.F., Fairhurst, S., Rossi, J.S., & Velasquez, M. (1991). The process of smoking cessation: An analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting and Clinical Psychology, 9*, 295 -304.

Dishman, R.K. (1982). Compliance or adherence in health related exercise. *Health Psychology, 1*, 237-267.

Dishman, R.K.(1988a). Exercise adherence research: Future directions. American Journal of Health Promotion, 3, 52-56.

Dishman, R.K.(1988b). Overview. In R.K. Dishman (Ed.) Exercise Adherence (pp.1-9).

Dishman, R.K.(1991). Increasing and maintaining exercise and physical activity. Behavior Therapy, 22, 345-378.

Dishman, R.K. (1994). Introduction: Consensus, problems, and prospects. In R.K. Dishman (Ed.), Advances in exercise adherence, (pp.1-27). Champaign, IL: Human Kinetics.

Dishman, R.K., & Dunn, A.L. (1988). Exercise adherence in children and youth: Implications for adulthood. In R.K. Dishman (Ed.), Exercise Adherence, (pp.155-200). Champaign, IL:Human Kinetics.

Dishman, R.K., Sallis, J., & Orenstein, D. (1985). The determinants of physical activity and exercise. Public Health Reports, 100, 158-171.

Duda, J.L., & Tappe, M.K. (1988). Personal investment in exercise among middle-aged and older adults. Perceived Motor Skills, 66, 543-549.

Engstrom, L.M. (1986). The process of socialization into keep-fit activities. Scandinavian Journal of Sport Science, 8, 89-97.

Ferguson, K.J., Yesalis, C.E., Pomrehn, P.R., & Kirkpatrick, M.B. (1989). Attitudes, knowledge, and beliefs as predictors of exercise intent and behavior in school children. Journal of School Health, 59, 112-115.

Fertman, C.I., & Chubb, N.H. (1992). The effects of a psycho educational program on adolescents' activity involvement, self-esteem, and locus of control. Adolescence, 27, 517-526.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and behavior. New York, NY: Adison-Wesley, Don Mills.

Godin, G., Jobin, J., & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. Canadian Journal of Public Health, 77, 359-362

Godin, G., & Lepage, L. (1986). Understanding the intentions of pregnant nullipara to not smoke cigarettes after childbirth. Journal of Drug Education, 18, 115-124.

Godin, G., & Shephard, R.J. (1990). Use of attitude-behavior models in exercise promotion. Sports Medicine, 10, 103-121.

Gottlieb, N.H., & Chen, M.S. (1985). Sociocultural correlates of childhood sporting activities: Their implications for heart health. Social Science in Medicine, 21, 533-539.

Gorley, T., & Gordon, S. (1995). An examination of the Transtheoretical model and exercise behavior in older adults. Journal of Sport and Exercise Psychology, 17, 312-324.

Grimley, D., Prochaska, J.O., Velicer, W.F., Blais, L.M., & DiClemente, C.C. (1994). The transtheoretical model of change. In T.M. Brinthaupt & R.P. Lipka (Eds.), Changing the self: Philosophies, techniques, and experiences, (pp.201-227). Albany, NY:State University of New York Press.

Greenockle, K.M., Lee, A.A., & Lomax, R. (1990). The relationship between selected student characteristics and activity patterns in a required high school physical education class. Research Quarterly for Exercise and Sport, 61, 59-69.

Jannis, I.L., & Mann, L. (1968). A conflict theory approach to attitude and decision making. In A. Greenwald, T. Brook, & T. Ostrom (Eds.), Psychological Foundations of Attitudes. New York: Academic Press.

Jannis, I.L., Mann, L. (1977). Decision-making: A psychological analysis of conflict, choice, and commitment. New York: Collier Macmillan.

Janz, N.K., & Becker, M.H. (1984). The health belief model: A decade later. Health Education Quarterly, 11, 1-47.

Kemper, H.C.G. (1994). The natural history of physical activity and aerobic fitness in teenagers. In R.K. Dishman (Ed.), Advances in Exercise Adherence, (pp.293-318). Champaign, IL:Human Kinetics.

Kendzierski, D. (1990). Decision-making versus decision implementation: An action control approach to exercise adoption and adherence. Journal of Applied Social Psychology, 20, 27-45.

Knapp, D. (1988). Behavioral management techniques and exercise promotion. In R.K. Dishman (Ed.), Exercise Adherence, (pp.203-235). Champaign, IL:Human Kinetics.

Kravitz, L., & Furst, D. (1991). Influence of reward and social support on exercise adherence in aerobic dance classes. Psychological Reports, 69, 423-426.

Leon, A.S., Connett, J., Jacobs, D.R., & Rauramma, R. (1987). Leisure-time physical activity levels and risk of coronary heart disease and death. Journal of the American Medical Association, 258, 2388-2395.

Marcus, B.H. (1995). Exercise behavior and strategies for intervention. Research Quarterly for Exercise and Sport, 66(4), 319-323.

Marcus, B.H., Banspach, S.W., Lefebvre, R.C., Rossi, J.S., Carleton, R.A., & Abrams, D.B.(1992). Using the stages of change model to increase the adoption of physical activity among community participants. American Journal of Health Promotion, 6, 424-429.

Marcus, B.H., Eaton, C.A., Rossi, J.S., & Harlow, L.L. (1992). Self-efficacy, decision making, and stages of change: An integrative model of physical exercise. Journal of Applied Social Psychology, 24, 489-508.

Marcus, B.H., & Owen, N. (1992). Motivational readiness, self-efficacy, ,and decision-making for exercise. Journal of Applied Social Psychology, 1, 3-16.

Marcus, B.H., Pinto, B.M., Simkin, L.R., Audrain, J.E., & Taylor, E.R. (1994). Application of theoretical models to exercise behavior among employed women. American Journal of Health Promotion, 9(1), 49-55.

Marcus, B.H., Rakowski, W., & Rossi, J.S.(1992). Assessing motivational readiness and decision-making for exercise. Health Psychology, 11, 257-261.

Marcus, B.H., Rossi, J.S., Selby, V.C., Niaura, R.S., & Abrams, D.B.(1992). The stages and processes of exercise adoption and maintenance in a work site sample. Health Psychology, 11, 386-395.

Marcus, B.H., Selby, V.C., Niaura, R.S., & Rossi, J.S. (1992). Self-efficacy and the stages of exercise behavior change. Research Quarterly for Exercise and Sport, 63 (1), 60-66.

Marcus, B.H., & Simkin, L.R. (1993). The stages of exercise behavior. Journal of Sports Medicine and Physical Fitness, 33, 83-88.

Marcus, B.H., & Simkin, L.R. (1994). The transtheoretical model: Applications to exercise behavior. Medicine and Science in Sports and Exercise, 26(11), 1400-1404.

Marlett, G.A., & Gordon, J.R. (1985). Relapse prevention: A self-control strategy for the maintenance of behavior change. New York, NY:Guilford Press.

Martin, J.E., Dubbert, P.M., Katell, A.D., Thompson, J.K., Racynski, J.R., Lake, M., Smith, P.O., Webster, J.S., Sikora, T., & Cohen, R.E. (1984). Behavioral control of exercise in sedentary adults: Studies 1 through 6. Journal of Consulting and Clinical Psychology, 52, 795-811.

McCauley, E. (1992). the role of efficacy conditions in the prediction of exercise behavior of middle-aged adults. Journal of Behavioral Medicine, 15, 65-68.

McConnaughy, E., Prochaska, J.O., & Velicer, W. (1983). Stages of change in psychotherapy: Measurement and sample profiles. Psychotherapy: Theory, Research, and Practice, 20, 368-375.

Melnyk, K.A.M. (1988). Barriers:A critical review of recent literature. Nursing Research, 37, 196-201.

Mirotznik, J., Speedling, E., Stein, R., & Bronz, C. (1985). Cardiovascular fitness program: Factors associated with participation and adherence. Public Health Reports, 100, 13-18.

Nahas, M.V. (1985). The effects of a short-term health fitness education program on the knowledge and attitudes of low fit college students. Unpublished doctoral dissertation, University of Southern California, Los Angeles, California.

O'Connell, D., & Velicer, W.F. (1988). A decisional balance measure and the stages of change model for weight loss. International Journal of Addictions, 23(7), 729-750.

O'Connor, M.J. (1994). Exercise promotion in physical education: Application of the transtheoretical model. Journal of Teaching in Physical Education, 14, 2-12.

Olson, J.M., & Zanna, M.P. (1987). Understanding and promoting exercise:A social psychological perspective. Canadian Journal of Public Health, 78, 1-7.

Paffenberger, R.S., Hyde, R.T., Wing, A.L., & Heish, C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. New England Journal of Medicine, 314, 605-613.

Perry, C.L., Stone, E.J., Parcel, G.S., Ellison, R.C., Nader, P.R., Webber, L.S., & Leupker, R.V. (1990). School-based cardiovascular health promotion: The child and adolescent trial for cardiovascular health (CATCH). Journal of School Health, 60, 406-413.

Prochaska, J.O. (1979). Systems of psychotherapy: A Transtheoretical analysis. Homewood, IL: Dorsey Press.

Prochaska, J.O., & DiClemente, C.C. (1982). Transtheoretical therapy: Toward a more integrative model of change. Psychotherapy: Theory, Research, and Practice, 20, 161-173.

Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self-change in smoking: Towards an integrative model of change. Journal of Consulting and Clinical Psychology, 51, 390-395.

Prochaska, J.O., & DiClemente, C.C. (1985). Common processes of self-change in smoking, weight control, and psychological distress. In S. Shiffman, & T. Wills (Eds.), Coping and substance use, pp.345-363. New York, NY:Academic Press.

Prochaska, J.O, DiClemente, C.C., & Norcross, J.C. (1992). In search of how people change: Applications to addictive behaviors. American Psychology, 47, 1102-1111.

Prochaska, J.O., DiClemente, C.C., Velicer, W., & Rossi, J. (1992). Criticisms and concerns of the transtheoretical model in light of recent research. British Journal of Addictions, 87, 825-828.

Prochaska, J.O., & Marcus, B.H. (1994). The transtheoretical model: Applications to exercise. In R.K. Dishman (Ed.), Advances in Exercise Adherence, (pp.161-180). Champaign, IL:Human Kinetics.

Prochaska, J.O., Velicer, W.F., DiClemente, C.C., & Fava, J.L. (1988). Measuring processes of change: Applications to the cessation of smoking. Journal of Consulting and Clinical Psychology, 56, 520-528.

Prochaska, J.O., Velicer, W.F., Rossi, J.S., Goldstein, M.G., Marcus, B.H., Rakowski, W., Fiore, C., Harlow, L.L., Redding, C.A., Rosenbloom, D., & Rossi, S.R. (1994). Stages of change and decisional balance for 12 problem behaviors. Health Psychology, 13, 39-46.

Prokhorov, A.V., Perry, C.L., Kelder, S.H., & Klepp, K.I. (1993). Lifestyle values of adolescents: Results form the Minnesota heart health youth program. Adolescence, 28(11), 637-647.

Reynolds, K.D., Killen, J.D., Bryson, S.W., Maron, D.J., Taylor, C.B., Maccoby, N., & Farquhar, J.W. (1990). Psychosocial predictors of physical activity in adolescents. Preventive Medicine, 19, 541-551.

Rodgers, W.M., & Brawley, L.R. (1991). The role of outcome expectancies in participation motivation . Journal of Sport and Exercise Psychology, 13, 411-427.

Rodgers, W.M., & Gauvin, L. (1995). Heterogeneity of self-efficacy and incentives for physical activity in highly active and moderately active exercisers. Journal of Behavioral Medicine (submitted for publication).

Rogers, R.W. (1975). A protection motivation theory of fear appeals and attitude change. Journal of Psychology, 91, 93-114.

Rosenstock, I.M. (1974). Historical origins of the Health Belief Model. Health Education Monographs, 2, 328-335.

Ross, J.G., Dotson, C.O., & Gilbert, G.G. (1985). The national children and youth fitness study: Are children getting appropriate physical activity? JOPERD, 56, 82-85.

Ross, J.G., & Gilbert, G.G. (1987). The national children and fitness summary II: A summary of findings. Journal of Physical Education recreation and Dance, 58, 51-56.

Rowland, T.W. (1986). Motivational factors in exercise training programs for children. Physician Sports Medicine, 14, 122-128.

Sabatelli, R.M, & Mazor, A.(1985). Differentiation, individuation, and identity formation: The integration of family system and individual development perspectives. Adolescence, 20, 619-633.

Sallis, J.F., & Hovell, M.F.(1990). Determinants of exercise behavior. In J.O. Holloszy & K.B. Pandolf (Eds.), Exercise and Sport Science Review 18, Baltimore, MD:Williams & Wilkins.

Sallis, J.F., Hovell, M.F., Hofstetter, C.R., Faucher, P., & Elder, J.P. (1989). A multivariate study of determinants of vigorous exercise in a community sample. Preventive Medicine, 18, 20-34.

Sallis, J.F., & Patrick, K. (1995). A consensus on physical activity guidelines for adolescents. Research Quarterly for Exercise and Sport, 66(3), 268-69.

Sallis, J.F., Pinski, R.B., Patterson, T.L., & Nader, P.R. (1988). The development of self-efficacy scales for health-related diet and exercise behaviors. Health Education Research, 3, 283-292.

Seefeldt, V. (1985). Selling the potential rather than the record. JOPERD, 56, 42-43.

Shephard, R.J., & Godin, G. (1986). Behavioral intentions and activity of children. In J. Rutenfranz, R. Mocellin, & F.Klint (Eds.), Children and exercise XII: Vol.17, International series on sport sciences, pp.103-109. Champaign, IL:Human Kinetics.

Simons-Morten, B.G., O'Hara, N.M., Simons-Morten, D.G., & Parcel, G.S. (1987). Children and fitness: A public health perspective. Research Quarterly for Exercise and Sport, 58, 295-302.

Skinner, B.F. (1953). Science and Human Behavior. New York, NY:Macmillan.

Slattery, M.L., & Jacobs, D.R. (1988). Physical fitness and cardiovascular disease mortality. American Journal of Epidemiology, 127, 571-580.

Slinker, S.F., Price, J.H., Roberts, S.M., & Jurs, S.G. (1984). Joggers versus non-exercisers: An analysis of knowledge, attitudes, and beliefs about jogging. Research Quarterly for Exercise and Sport, 55, 371-378.

Sonstroem, R.J.(1988). Psychological Models. In R.K. Dishman (Ed.), Exercise Adherence (pp.125-153). Champaign, IL:Human Kinetics.

Stephens, T., & Craig, C.L. (1990). The well-being of Canadians: Highlights of the 1988 Campbell's survey. Ottawa:Canadian Fitness and lifestyle research Institute.

Stephens, T., Craig, C.L., & Ferris, B.F. (1986). Adult physical activity in Canada: Findings form the Canada fitness survey I. Canadian Journal of Public Health, 77, 285-290.

Stephens, T., Jacobs, D.R., & White, C.C. (1985). A descriptive epidemiology of leisure time physical activity. Public Health Reports, 100, 147-156.

Sunnegardh, J., Bratteby, L.E., & Sjolin, S. (1985). Physical activity and sports involvement in 8 and 13 year old children in Sweden. Journal of School Health, 74, 904-912.

Tappe, M.K., Duda, J.L., & Ehrnwald, P.M. (1989). Perceived barriers to exercise among adolescents. Journal of School Health, 59, 153-155.

Triandis, H.C. (1977). Interpersonal behavior. Monterey, CA:Brook/Cole.

Velicer, W.F., DiClemente, C.C., Prochaska, J.O., & Brandenburg, N.(1985). A decisional balance measure for assessing and predicting smoking status. Journal of Personality and Social Psychology, 48, 1279-1289.

Wankel, L.M. (1987). Enhancing motivation for involvement in voluntary exercise programs. In M. Maehr, & D. Kleiber (Eds.), Advances in motivation and achievement: Enhancing Motivation, (pp.239-286). Greenwich, CT:JAI Press.

Wankel, L.M., & Hills, C. (1994). A social marketing and stage of change perspective of interventions to enhance physical activity: The importance of PRs. In H. Quinney, L. Gauvin, & A. Wall (Eds.), Proceedings of the International Conference on Physical Activity, Fitness and Health: Toward Active Living, (pp. 115 -122), Champaign, IL:Human Kinetics.

Williams, A. (1988). Physical activity patterns among adolescents: Some curricular implications. Physical Education Review, 11(1), 28-39.

Wing, R.R., Marcus, M.D., Epstein, L.H., & Jawad, A. (1991). A "family-based" approach to treatment of obese type II diabetic patients. Journal of Consulting and Clinical Psychology, 59, 156-162.

Wurtle, S.K., & Maddux, J.E. (1987). Relative contributions of Protection Motivation Theory components in predicting exercise intentions and behavior. Health Psychology, 6, 453-466.

APPENDIX A

EXERCISE BEHAVIOR SURVEY

Please answer the following questions as clearly and honestly as you can. Read all of the instructions, questions, and available choices carefully before giving your answer. Remember this is not a test and your thoughts, feelings, and experiences are what counts. Feel free to ask for help if you have any questions about any part of this questionnaire. All responses will remain completely confidential. Thank You for participating.

Angela L. Cooney
☺

For each question below, using a check mark, please mark **YES** or **NO**. Answer the questions for vigorous activity, then answer the questions about moderate activity.

A. **Vigorous physical activity/exercise** includes hard activities such as jogging, aerobics, swimming, and biking. For vigorous activity to be regular, it must last at least **20 minutes each time**, and be done **at least 3 days per week**.

	YES/NO	
1. I currently participate in vigorous physical activity.		
2. I intend to increase my participation in vigorous physical activity in the next six months.		
3. I currently engage in regular vigorous physical activity.		
4. I have been participating in vigorous physical activity regularly for the past six months.		
5. In the past, I have been regularly physically active in vigorous activities for a period of at least 3 months.		

B. **Moderate physical activity/exercise** includes such activities as walking, gardening, and heavy house cleaning. For moderate activity to be regular, it must add up to a total of **30 or more minutes per day**, and be done **at least 5 days per week**. For example, you could take a 30 minute walk or take a 10 minute walk, rake leaves for 10 minutes, and climb up stairs for 10 minutes

	YES/NO	
6. I currently participate in moderate physical activity.		
7. I intend to increase my participation in moderate physical activity in the next 6 months.		
8. I currently engage in regular moderate physical activity.		

9. I have been participating in moderate physical activity regularly for the past six months.		
10. In the past, I have been regularly physically active in moderate activities for a period of at least 3 months.		

☞CONFIDENCE FOR PHYSICAL ACTIVITY/EXERCISE☜

Please indicate by checking the number that best describes how confident you are that you could exercise in each of the following situations.

1=Not At All Confident 2=Slightly Confident 3=Moderately Confident
4=Very Confident 5=Extremely Confident

	1	2	3	4	5
When I am tired.					
When I am in a bad mood.					
When I feel I don't have time.					
When I am on vacation.					
When it is raining, snowing, or is cold outside.					

☞DECISION-MAKING FOR PHYSICAL ACTIVITY/EXERCISE☜

Please rate how important each statement is in your decision whether or not to exercise. In each case, think about how you feel right now, not how you have felt in the past or would like to feel. Please check the number that best describes your answer.

1=Not At All Important 2=Slightly Important 3=Moderately Important
4=Very Important 5=Extremely Important

	Not at all Important			**Extremely Important**	
	1	**2**	**3**	**4**	**5**
I would have more energy for my friends and family if I exercised regularly.					
Regular exercise would help me relieve tension.					

I think I would be too tired to do my daily work after exercising.					
I would feel more confident if I exercised regularly.					
I would sleep more if I exercised regularly.					
I would feel good about myself if I kept my commitment to exercise regularly.					
I would find it difficult to find an exercise activity that I enjoy that is not affected by bad weather.					
I would like my body better if I exercised regularly.					
It would be easier for me to perform routine physical tasks if I exercised regularly.					
I would feel less stressed if I exercised regularly.					
I feel uncomfortable when I exercise because I get out of breath and my heart beats very fast.					
I would feel more comfortable with my body if I exercised regularly.					
Regular exercise would take too much of my time.					
Regular exercise would help me have a more positive outlook on life.					
I would have less time for my friends and family if I exercised regularly.					
At the end of the day, I am too exhausted to exercise.					

☞PHYSICAL ACTIVITY/EXERCISE EXPERIENCES☜

The following experiences can affect the exercise habits of some people. Think of any similar experiences you may be currently having or have had during the past month. Then rate how frequently the event occurs. Please check the number that best describes your answer for each experience.

How frequently does this occur?

1=Never 2=Seldom 3=Occasionally 4=Often 5=Repeatedly

	Never			**Repeatedly**	
	1	**2**	**3**	**4**	**5**
Exercise is my special time to relax and recover from the days worries, not a task to get out of the way.					

I am aware of more and more people encouraging me to exercise these days.					
I do something nice for myself for making efforts to exercise more.					
I have someone who points out my reasons for not exercising.					
I have someone who provides feedback about my exercising.					
I remove things that contribute to my inactivity.					
I am the only one responsible for my health, and only I can decide whether or not I will exercise.					
I look for information related to exercise.					
I avoid spending long periods of time in environments that promote inactivity.					
I feel I would be a better role model for others if I exercised regularly.					
I think about the type of person I will be if I keep exercising.					
I notice that more businesses are encouraging their employees to exercise by offering fitness courses and time off to work out.					
I wonder how my inactivity affects those people who are close to me.					
I realize that I might be able to influence others to be healthier if I would exercise more.					
I get frustrated with myself when I don't exercise.					
I am aware that many health clubs now provide free baby-sitting services to their members.					
Some of my close friends might exercise more if I would.					
I consider the fact that I would feel more confident in myself if I exercised regularly.					
When I feel tired I make myself exercise anyway because I will feel better afterward.					
When I'm feeling tense, I find exercise a great way to relieve my worries.					
Instead of remaining inactive I engage in some physical activity.					
I tell myself I am able to keep exercising if I want to.					

I put things around my home to remind me of exercising.					
I tell myself that if I try hard enough I can keep exercising.					
I recall information people have personally given me on the benefits of exercise.					
I make commitments to exercise.					
I reward myself when I exercise.					
I think about information form articles and advertisements on how to make exercise a regular part of my life.					
I keep things around me at school that remind me to exercise.					
I find society changing in ways that make it easier for people to exercise.					
Warnings about health hazards of inactivity affect me emotionally.					
Dramatic portrayals of the evils of inactivity affect me emotionally.					
I react emotionally to warnings about an inactive lifestyle.					
I worry that inactivity can be harmful to my body.					
I am considering the idea that regular exercise would make me a healthier, happier person to be around.					
I have someone who I can depend when I am having problems with exercising.					
I read articles about exercise in an attempt to learn more about it.					
I try to set realistic goals for myself rather than setting myself up for failure by expecting too much.					
I have a healthy friend that encourages me to exercise when I don't feel up to it.					
When I exercise, I tell myself that I am being good to myself by taking care of my body.					

✏During the last seven days, how much total time did you spend in VIGOROUS physical activity/exercise and MODERATE physical activity/exercise? Record only time actually engaged in the activity (ignore breaks, rest periods, etc.). Please do not record any LIGHT physical activity (office work, light housework, very light sports such as bowling, or any activity involving sitting).

Total Hours For Last 7 Days
(to nearest .5 hours)

⌚VIGOROUS ACTIVITY/EXERCISE (activities such as jogging, running, swimming, strenuous sports such as singles tennis, badminton, racquetball, shovelling snow, chopping wood, cross-country skiing, soccer, ...). ______________

⌚MODERATE ACTIVITY/EXERCISE (activities such as golf or doubles tennis, biking on level ground, brisk walking for exercise, walking to work or school, volleyball, table tennis, calisthenics, ...) ______________

!!List the types of activities you participated in over the past seven days.

Monday ______________________________
Tuesday ______________________________
Wednesday ______________________________
Thursday ______________________________
Friday ______________________________
Saturday ______________________________
Sunday ______________________________

⌚How many hours of sleep did you have last night?
____

✏How many times have you exercised over the last four months?

_____ None
_____ Less than once a month
_____ About once a month
_____ About 2 or 3 times a month
_____ About 1 or 2 times a week
_____ 3 times or more a week

✏Do you intend to engage in physical activity over the next 3 months? Yes ____ No ____

How many times? _____ None
_____ Less than once a month
_____ About once a month
_____ About 2 or 3 times a month

_____ About 1 or 2 times a week
_____ 3 times or more a week

✏Now, provide a bit of information about yourself.

What is your gender? ______ Male♂ _____ Female♀

How old are you? ____________

What grade are you in?
______ Tenth grade
______ Eleventh grade
______ Twelfth grade

What is the name of your school?

____

Are you currently involved in other activities outside of being a student (i.e., part time job, member of an athletic team, etc.)?

____
____
____
____

What is your name? __________________________
Phone Number? ____________________

Thank you for participating
in this study!

APPENDIX B

FACULTY OF PHYSICAL EDUCATION AND RECREATION
UNIVERSITY OF ALBERTA, VAN VLIET PHYSICAL EDUCATION AND RECREATION CENTRE
EDMONTON, ALBERTA T6G 2H9

Informed Consent Form

Project Title:	Exercise Behavior of Adolescents.	
Investigators:	Dr. A.B. Nielsen	(403) 492-3839
	Angela L. Cooney, Master of Arts Student	(403) 437-6298

Dear Parent or Guardian:

We are conducting a survey regarding exercise behavior among adolescents. In particular we are interested in finding out how confident adolescents are in exercising, as well as the processes they use concerning exercise decisions. The potential value of this project will be in attempting to make the exercise behavior of adolescents better understood and perhaps ultimately improved. In order to conduct this project, we are asking high school students in the 10th, 11th, and 12th grades for their participation. We would like to have the opportunity to work with your son or daughter.

Your son or daughter will be asked to complete a questionnaire during one of their scheduled class sessions. The questionnaire will contain measures that reflect your son or daughter's confidence in exercising and the strategies they use to help themselves exercise. Total involvement will require no more than a total of one and one half hour (1 ½) of their time in order to review the purposes of the project and to complete the questionnaire.

I would like to emphasize that your son or daughter will not be subjected to any risk of physical or psychological harm as a result of participating in this study. Participants will be required to provide their name so that we may keep track of and match the surveys they complete. Further data collection from subjects may occur towards the end of the school term. Your phone number is necessary in order that we may contact your son or daughter again. When all data collection has been completed, each participant will be assigned a numerical code and all names and phone numbers will be discarded in order to ensure the privacy of your son or daughter. Please be ensured that the identity and personal information that your son or daughter provides will be held in the strictest of confidence and will be viewed only by the investigators of this study. This information will be kept in a locked filing cabinet by the investigators and teachers will not have access to the results of your son or daughter. In no way shall your son or daughter's responses affect their academic standing. Participation is voluntary and subjects may decline to participate or withdraw from the study at any time, for any reason.

This study has received approval from the Faculty of Physical Education and Recreation at the University of Alberta and by your child's school and school board. If you have any questions or concerns about this request, please do not hesitate to contact either one of the investigators listed at the top of this page. We would be more than willing to answer any inquiries concerning the procedures of this project to ensure that they are fully understood.

On XXXXXXX,XX, we had the opportunity to speak to your child about this project during one of their scheduled class periods. However, the written consent of both you and your child is needed in order to enable your child to participate in this study. To indicate consent, please complete the bottom portion of this form and have your child return this form to the teacher of the course in which we previously spoke to your child. Please have your child return this form by XXXXXXXX,XX.

Thank You for your consideration.
Cordially,

Dr. A. Brian Nielsen
Professor
(403) 492-3839

Angela L. Cooney
Master of Arts Candidate
(403) 437-6298

INFORMED WRITTEN CONSENT
EXERCISE BEHAVIOR SURVEY

PERMISSION GRANTED:
DATE:____________________________

____________________________(child's name) has my permission, and has agreed to participate in the above named study.

____
Parent / Guardian Signature

____
Child's Signature

____
Phone Number

APPENDIX C

Stage of Change Measure and Coding

For each question below, please mark **YES** or **NO**. Answer the questions for vigorous activity, then answer the questions about moderate activity.

A. **Vigorous physical activity/exercise** includes hard activities such as jogging, aerobics, swimming, and biking. For vigorous activity to be regular, it must last at least **20 minutes each time**, and be done **at least 3 days per week**.

	YES/	NO
1. I currently participate in vigorous physical activity.		
2. I intend to increase my participation in vigorous physical activity in the next six months.		
3. I currently engage in regular vigorous physical activity.		
4. I have been participating in vigorous physical activity regularly for the past six months.		
5. In the past, I have been regularly physically active in vigorous activities for a period of at least 3 months.		

B. **Moderate physical activity/exercise** includes such activities as walking, gardening, and heavy house cleaning. For moderate activity to be regular, it must add up to a total of **30 or more minutes per day**, and be done **at least 5 days per week**. For example, you could take a 30 minute walk or take a 10 minute walk, rake leaves for 10 minutes, and climb up stairs for 10 minutes

	YES/	NO
6. I currently participate in moderate physical activity.		
7. I intend to increase my participation in moderate physical activity in the next 6 months.		
8. I currently engage in regular moderate physical activity.		
9. I have been participating in moderate physical activity regularly for the past six months.		
10. In the past, I have been regularly physically active in moderate activities for a period of at least 3 months.		

Precontemplation = "No" to items 1 to 4
Contemplation = "Yes" to item 2, and "No" to items 1, 3, & 4

*Preparation =	"Yes" to item 1, and "No" to items 3 & 4
Action =	"Yes" to item 1 and 3, "No" to item 4
Maintenance=	"Yes" to items 1, 3, & 4

*(question #2 becomes optional at this point since it is only used to distinguish Contemplation from Precontemplation).

APPENDIX D

Processes of Behavior Change Measure

☞PHYSICAL ACTIVITY/EXERCISE EXPERIENCES☜

The following experiences can affect the exercise habits of some people. Think of any similar experiences you may be currently having or have had during the past month. Then rate how frequently the event occurs. Please check the number that best describes your answer for each experience.

How frequently does this occur?

1=Never 2=Seldom 3=Occasionally 4=Often 5=Repeatedly

	Never			Repeatedly	
	1	2	3	4	5
Exercise is my special time to relax and recover from the days worries, not a task to get out of the way.(CC)					
I am aware of more and more people encouraging me to exercise these days.(SoL)					
I do something nice for myself for making efforts to exercise more.(RM)					
I have someone who points out my reasons for not exercising.(HR)					
I have someone who provides feedback about my exercising.(HR)					
I remove things that contribute to my inactivity.(SC)					
I am the only one responsible for my health, and only I can decide whether or not I will exercise.(SL)					
I look for information related to exercise.(CR)					
I avoid spending long periods of time in environments that promote inactivity.(SC)					
I feel I would be a better role model for others if I exercised regularly.(ER)					
I think about the type of person I will be if I keep exercising.(SR)					

I notice that more businesses are encouraging their employees to exercise by offering fitness courses and time off to work out.(SoL)					
I wonder how my inactivity affects those people who are close to me.(ER)					
I realize that I might be able to influence others to be healthier if I would exercise more.(ER)					
I get frustrated with myself when I don't exercise.(SR)					
I am aware that many health clubs now provide free baby-sitting services to their members.(SoL)					
Some of my close friends might exercise more if I would.(ER)					
I consider the fact that I would feel more confident in myself if I exercised regularly.(SR)					
When I feel tired I make myself exercise anyway because I will feel better afterward.(CC)					
When I'm feeling tense, I find exercise a great way to relieve my worries.(CC)					
Instead of remaining inactive I engage in some physical activity.(CC)					
I tell myself I am able to keep exercising if I want to.(SL)					
I put things around my home to remind me of exercising.(SC)					
I tell myself that if I try hard enough I can keep exercising.(SL)					
I recall information people have personally given me on the benefits of exercise.(CR)					
I make commitments to exercise.(SL)					
I reward myself when I exercise.(RM)					
I think about information form articles and advertisements on how to make exercise a regular part of my life.(CR)					
I keep things around me at school that remind me to exercise.(SC)					
I find society changing in ways that make it easier for people to exercise.(SoL)					
Warnings about health hazards of inactivity affect me emotionally.(DR)					

Dramatic portrayals of the evils of inactivity affect me emotionally.(DR)					
I react emotionally to warnings about an inactive lifestyle.(DR)					
I worry that inactivity can be harmful to my body.(DR)					
I am considering the idea that regular exercise would make me a healthier, happier person to be around.(SR)					
I have someone who I can depend when I am having problems with exercising.(HR)					
I read articles about exercise in an attempt to learn more about it.(CR)					
I try to set realistic goals for myself rather than setting myself up for failure by expecting too much.(RM)					
I have a healthy friend that encourages me to exercise when I don't feel up to it.(HR)					
When I exercise, I tell myself that I am being good to myself by taking care of my body.(RM)					

Each process is assessed by 4 questions. The taxonomy is coded on the above measure. The Cognitive Processes are: Consciousness Raising (CR), Dramatic Relief (DR), Environmental Reevaluation (ER), Self-reevaluation (SR), and Social Liberation (SoL). The Behavioral Processes are: Counter conditioning (CC), helping Relationships (HR), Reinforcement Management (RM), Self-liberation (SL), and Stimulus Control (SC).

Each process is represented by 4 items which are summed and averaged. The average for each process-type can be summed and averaged to arrive at a total for Behavioral processes and a separate score for Cognitive processes.

APPENDIX E

Decision-Making For Physical Activity/Exercise Measure

☞DECISION-MAKING FOR PHYSICAL ACTIVITY/EXERCISE☜

Please rate how important each statement is in your decision whether or not to exercise. In each case, think about how you feel right now, not how you have felt in the past or would like to feel. Please check the number that best describes your answer.

1=Not At All Important 2=Slightly Important 3=Moderately Important
4=Very Important 5=Extremely Important

	1	2	3	4	5
✚I would have more energy for my friends and family if I exercised regularly.					
✚Regular exercise would help me relieve tension.					
I think I would be too tired to do my daily work after exercising.					
✚I would feel more confident if I exercised regularly.					
✚I would sleep more if I exercised regularly.					
✚I would feel good about myself if I kept my commitment to exercise regularly.					
I would find it difficult to find an exercise activity that I enjoy that is not affected by bad weather.					
✚I would like my body better if I exercised regularly.					
✚It would be easier for me to perform routine physical tasks if I exercised regularly.					
✚I would feel less stressed if I exercised regularly.					
I feel uncomfortable when I exercise because I get out of breath and my heart beats very fast.					
✚I would feel more comfortable with my body if I exercised regularly.					
Regular exercise would take too much of my time.					
✚Regular exercise would help me have a more positive outlook on life.					

I would have less time for my friends and family if I exercised regularly.					
At the end of the day, I am too exhausted to exercise.					

Average the positive and negative items separately to get three scores: Pros, Cons, and Decisional Balance (subtract the cons from the pros). The positive items are indicated with + signs.

APPENDIX F

Self-Efficacy or Confidence for Exercise Measure

☞CONFIDENCE FOR PHYSICAL ACTIVITY/EXERCISE☜

Please indicate by checking the number that best describes how confident you are that you could exercise in each of the following situations.

1=Not At All Confident 2=Slightly Confident 3=Moderately Confident
4=Very Confident 5=Extremely Confident

	1	2	3	4	5
When I am tired.					
When I am in a bad mood.					
When I feel I don't have time.					
When I am on vacation.					
When it is raining, snowing, or is cold outside.					

Self-efficacy is scored by computing an average for the sum of all five items.

APPENDIX G

Self-Report Measure of Physical Activity and Exercise

✏During the last seven days, how much total time did you spend in VIGOROUS physical activity/exercise and MODERATE physical activity/exercise? Record only time actually engaged in the activity (ignore breaks, rest periods, etc.). Please do not record any LIGHT physical activity (office work, light housework, very light sports such as bowling, or any activity involving sitting).

Total Hours For Last 7 Days
(to nearest .5 hours)

⌚VIGOROUS ACTIVITY/EXERCISE (activities such as jogging, running, swimming, strenuous sports such as singles tennis, badminton, racquetball, shovelling snow, chopping wood, cross-country skiing, soccer, ...). ____________

⌚MODERATE ACTIVITY/EXERCISE (activities such as golf or doubles tennis, biking on level ground, brisk walking for exercise, walking to work or school, volleyball, table tennis, calisthenics, ...) ____________

!!List the types of activities you participated in over the past seven days.

Monday ______________________________
Tuesday ______________________________
Wednesday ______________________________
Thursday ______________________________
Friday ______________________________
Saturday ______________________________
Sunday ______________________________

⌚How many hours of sleep did you have last night?
____

1. Add up all the hours of sleep subject had.
____
2. Multiply the total number of hours of sleep by 1.
____
3. Add up the total numbers of hours spent in moderate activity by 4.____________________
4. Multiply the hours spent in moderate activity by 4.
____
5. Add up the total number of hours spent in hard activity.

____

6. Multiply the hours spent in hard activity by 6.

____

7. Add up the total number of hours spent in very hard activity.

____

8. Multiply the hours spent in very hard activity by 10.

____

9. Add up the figures in lines 1, 3, 5, and 7.

____

10. Hours spent in light activity is equal to 24 hours minus the hours in lines 1, 3, 5, and 7.

____

11. Multiply the figure in line 10 by 1.5.

____

12. Add up the figures in lines 2, 4, 6, 8, and 11.

____

13. The figure you arrive at in line 12 is the total kilocalorie per kilogram of body weight expended per day.

____

Physical Activity Self-Report Item

✏How many times have you exercised over the last four months?

_____ None
_____ Less than once a month
_____ About once a month
_____ About 2 or 3 times a month
_____ About 1 or 2 times a week
_____ 3 times or more a week

APPENDIX H

Intention To Exercise Measure

✏Do you intend to engage in physical activity over the next 3 months? Yes ____ No ____

How many times? _____ None

_____ Less than once a month

_____ About once a month

_____ About 2 or 3 times a month

_____ About 1 or 2 times a week

_____ 3 times or more a week

APPENDIX I

ANOVA s For Each Process of Change

Variable *Counterconditioning*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	98.5755	24.6439	36.8967	.0000
Within Groups	523	349.3203	.6679		
Total	527	447.8958			

Variable *Consciousness Raising*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	29.8039	7.4510	7.4362	.0000
Within Groups	523	524.0382	1.0020		
Total	527	553.8421			

Variable *Dramatic Relief*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	7.8502	1.9626	1.9018	.1088
Within Groups	523	539.7066	1.0319		
Total	527	547.5568			

Variable *Environmental Reevaluation*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	9.1565	2.2891	2.5578	.0379
Within Groups	523	468.0581	.8949		
Total	527	477.2146			

Variable *Helping Relationships*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	27.4340	6.8585	7.7473	.0000
Within Groups	523	463.0022	.8853		
Total	527	490.4362			

Variable *Reinforcement Management*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	31.5431	7.8858	10.0367	.0000
Within Groups	523	410.9195	.7857		
Total	527	442.4626			

Variable *Stimulus Control*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	27.8635	6.9659	10.9488	.0000
Within Groups	523	332.7462	.6362		
Total	527	360.6098			

Variable *Self Liberation*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	55.7582	13.9395	23.4373	.0000
Within Groups	523	311.0595	.5948		
Total	527	366.8177			

Variable *Social Liberation*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	5.6912	1.4228	1.9535	.1003
Within Groups	523	380.9147	.7283		
Total	527	386.6059			

Variable *Self Reevaluation*
By Stage

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	4	17.3721	4.3430	4.3491	.0018
Within Groups	523	522.2692	.9986		
Total	527	539.6413			